MAY, 1956

PIPE LINE INDUSTRY

Gulf Publishing Company

CONSTRUCTION • OPERATIONS • MAINTENANCE

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Special Report: Offshore Pipelining

Pages 28-49

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SERIAL RECORD
MAY 25 1956

Map of Texas-Louisiana Coastal Area

Inserted this issue

How Vulnerable Are Our Pipe Lines?

Page 50

urn the page for additional contents and Quick Review of this issue

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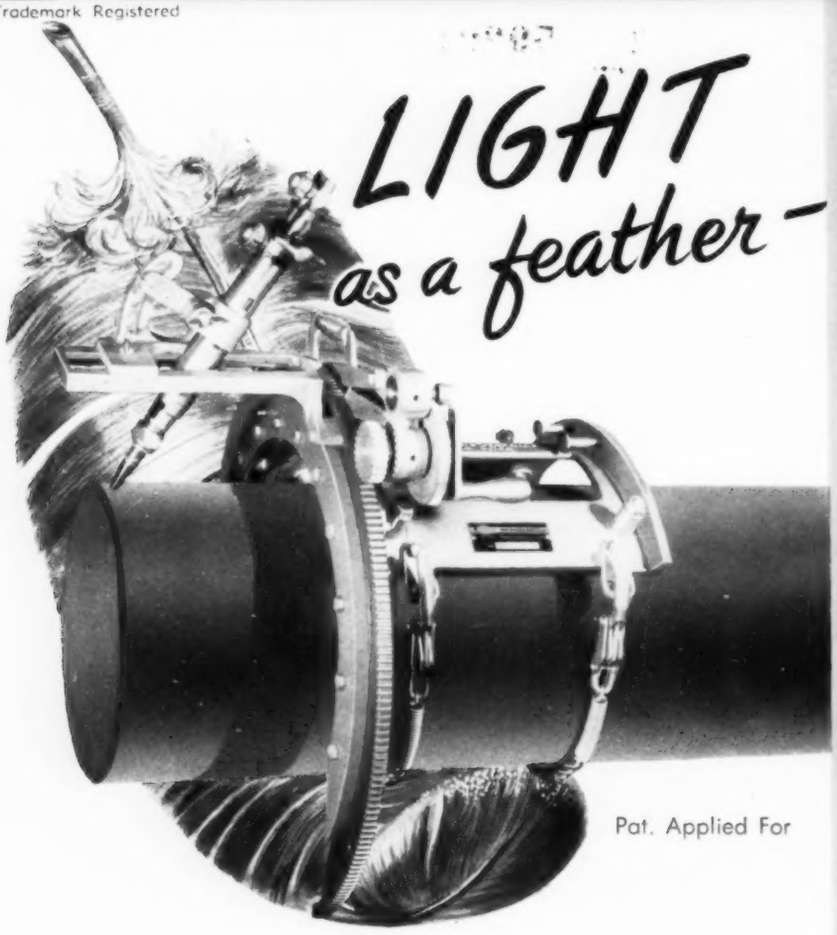

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PIPE LINE INDUSTRY

CONTENTS and Quick Review

B 592910

May, 1956 Vol. 4, No. 5

B 592910

To help you put first things first, scan these time-saving digests, checking ☑ those you want to read first.

SPECIAL REPORT ON OFFSHORE PIPE LINES

What the Gulf Can Do to a Pipe Line

☐ Each phase of offshore pipelining is faced with special problems . . . the tides, waves and currents . . . the bottom conditions and damaging effect of marine environment. The experience of men who make a study of ocean conditions can help cut costs in laying and operating offshore lines.

By John C. Freeman and Charles L. Bretschneider ..... Page 28

New Ideas Promise Faster Pipe Laying Offshore

☐ Construction of offshore pipe lines have been custom-built jobs, each depending on the whims of the weather. Now many of the new ideas in the "friction transposition" method promise to offset the effect of uncooperative weather and stubborn seas. The goal: construction of offshore lines using standardized methods.

By Melvin A. Judah..... Page 32

Work With the Weather—It's Cheaper

☐ It's a well-worn phrase that says everyone talks about the weather but no one does anything about it. You can't control the weather in offshore operations, but there are reports available that will enable you to schedule operations when conditions are best. Using these records will save time, money and labor in Gulf operations.

By De Witt R. Gayle, Jr.,..... Page 35

Planning the Offshore Pipe Line

☐ Economics is the governing factor. Cost of barging oil from Magnolia's Eugene Island location is five times the cost of transporting it through a 48-mile 12-inch pipe line. As offshore production increases, submarine lines appear more feasible. Here are the methods used in surveying and selecting a pipe line route.

By Clyde Aldridge..... Page 39

How One Company Solved Its Problems Offshore

☐ Marine Gathering Company laid its first line into the Gulf of Mexico in 1950. Corrosion protection and prevention of damage to the beach line and platform risers are the critical maintenance problems. Here is what they have learned in six years of pipelining offshore.

By R. C. Ledford..... Page 42

Corrosion . . . and 33 Years of Submarine Pipelining

☐ In just ten years since Creole Petroleum Corporation began a coordinated corrosion control program in Lake Maracaibo, corrosion losses have been cut sharply. Average pipe life has been increased to 15 years and with improved coating practices may soon reach 20 years. Coatings, cathodic protection and complete records of the marine lines are paying off.

By H. T. Brundage..... Page 45

Swimming Lessons: Key to Offshore Safety

☐ Ask the man who almost drowned once. He's the best salesman for swimming lessons in an offshore safety program. Here's how Creole Petroleum Corporation's program is paying off by cutting down on accidents and making employes more safety conscious.

By Clifford G. Janney..... Page 48

Cost of Laying Pipe Lines in the Gulf

☐ Read this month's Rule of Thumb for a way to estimate quickly the cost of laying offshore pipe lines based on 1956 operations. Turn to..... Page 58

How Vulnerable Are Our Pipe Lines?

☐ How would U. S. pipe lines fare in event of a nuclear attack by a foreign enemy? Here's an expert on industrial defense planning who says that buried facilities likely would survive with little damage but that there are critical points where damage could be crippling to the nation's defense network.

By Neil P. Hurley..... Page 50

Conditioning Gas for Transmission (Part 2)

☐ Increasing use of new dehydrating agents plus developments in automation point up improvements in operation of gas treating plants. The first part of this two-part series (April PIPE LINE INDUSTRY) discussed particulate matter removal and gas purification.

By A. L. Kohl and F. C. Riesenfeld..Page 54

Can You Relax?

☐ Here's how one company is helping its supervisory personnel produce more effectively by cutting down on fatigue ..... Page 56

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PIPE LINE INDUSTRY published every month. Entered as second class mail matter July 9, 1954, at the post office at Houston, Texas, under the act of March 3, 1879.

Oysters or Eagles?

By REV. KENNETH W. SOLLITT
First Baptist Church, Midland, Mich.

The oyster is endowed with a ready-made house to live in. All he has to do is to open the doors of his house to take in his food and close them again to keep out his enemies. He has perfect social security. Yet he is the easiest fish in the world to catch, crush, and cook. He always ends up in the soup. So what does his vaunted security really amount to?

The eagle, on the other hand, is peculiar among created things in another respect. When a severe storm strikes, all other birds either hide from the storm or try to fight it as long as their strength holds out. The eagle neither fights nor runs away. He simply sets his wings so the fury of the storm itself lifts him above the storm where the sun is shining, and there he remains, "free as a bird," until the storm is over. And only a fool would pity the eagle because he isn't an oyster.

The road to freedom in America must begin with the decision as to what kind of freedom we want. Is it freedom *from* something, or freedom *for* something?

To our forefathers, freedom meant the right to risk capital in the hope of a return on their investments; the right of unlimited expansion of their businesses; the right to let the people, in true democratic fashion, cast their ballots in the cash registers of the nation for the businesses which served them best. Freedom to them was a positive thing, and they wisely chose the eagle as their national emblem.

•

More recently we have been indoctrinated with the negative idea that by "freedom" we mean freedom *from* taking risks and making our own choices and decisions. This negative attitude toward freedom exhibits itself in the very expressions we use. Instead of freedom *for* life, liberty, and the pursuit of happiness, we speak of freedom *from* want, worry, and war (and work too, if possible). And we have been so busy fleeing from these spectres that we have turned a corner and run right into their arms.

We have sought freedom from fear so avidly that all it has gotten us is a fear of freedom. We are fast becoming a nation of oysters. Instead of following the time-honored custom of honest men and enjoying the freedom to work for, save for, and buy the things we want, we have thought that it would be easier to elect men to Congress who would give us what we want at the expense of others.

And so our new immoral freedom to take by law that which belongs to another has destroyed the old freedom to enjoy unmolested the fruits of our ingenuity and toil. First, we must decide which kind of freedom we want in the years ahead, the freedom of oysters or the freedom of eagles, the freedom of parasites or the freedom of noble men, the freedom of pirates or the freedom of honest persons.

Second, if it is the freedom of honest persons that we hope to enjoy, we must resist all tendencies toward further socialization, for socialism is piracy. Socialism is robbing the man who earns for the benefit of the one who doesn't. It is in every sense a system of "the survival of the sickest" because it robs the ambitious of their initiative and keeps the people who never had any initiative from developing any.

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Socialism has demonstrated four facts over and over again:

- You can't multiply wealth by dividing it.
- It does no good to get rid of a few little monopolies by creating a big one called "government."
- The government can't give what it does not first take away.
- It can never take away enough to supply the ever increasing demands of those who are led to believe they are getting something for nothing when they get it from Uncle Sam.

If we want to be a free people, we must begin to do what we ought to do because we ought to do it and not just when we are forced to it. This demanding that we be forced to be good before being willing to behave, is the root of much of our trouble. Burton Parks in *Better Homes and Gardens* put it this way: "We'll never reach maturity in America until we get over the idea that whatever is legal is also moral."

No people can long maintain their freedom unless they are morally worthy of it. The only alternative to the imposition of controls from without is the exercise of controls from within. The only alternative to being forced to do what we ought, which is a form of slavery, is to do what we ought because we want to—and this is the only basis on which freedom can be built.

Let us here dedicate ourselves to showing that covetousness doesn't pay, that liberty is never license to do as we please but only freedom to do as we ought, and that freedom is only for those who will accept the responsibilities that go along with it.

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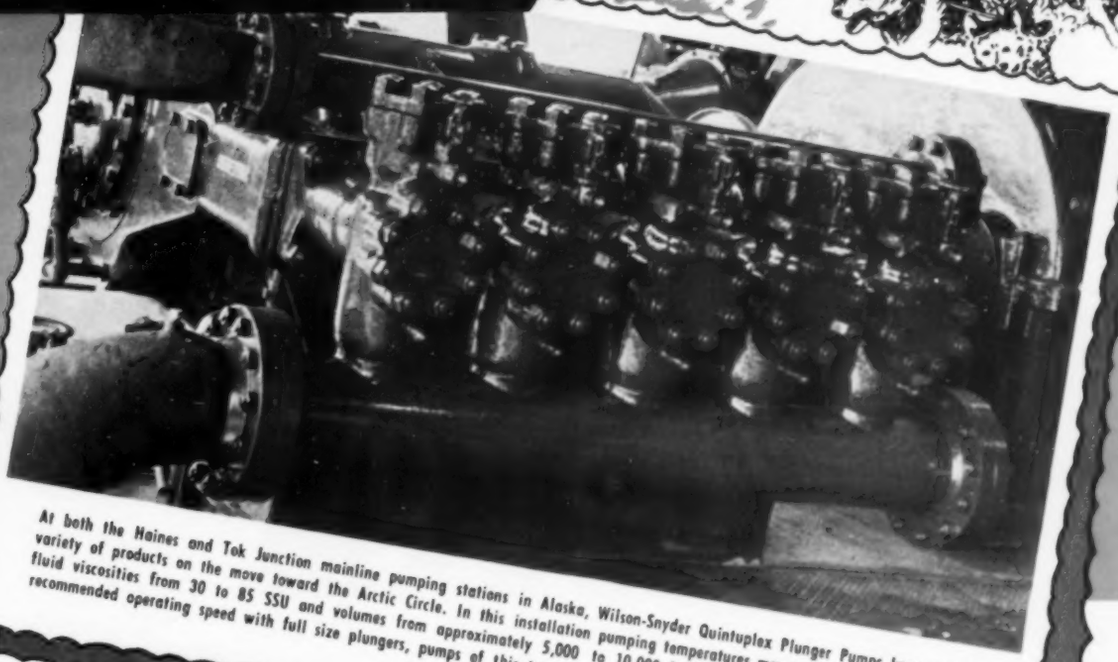
Wilson-Snyder No. 558-P Quintuplex Plunger Pumps

...chosen for another critical pumping job!



At both the Haines and Tok Junction mainline pumping stations in Alaska, Wilson-Snyder Quintuplex Plunger Pumps keep a wide variety of products on the move toward the Arctic Circle. In this installation pumping temperatures may vary from 80 to —20° F, fluid viscosities from 30 to 85 SSU and volumes from approximately 5,000 to 10,000 bpd per pump at 1,200 psi. At maximum recommended operating speed with full size plungers, pumps of this type are capable of handling up to 17,500 bpd at 1,270 psi.

IN THE FIRST PUMPING STATION of the Alaska Products Pipe Line at Haines, Alaska . . . as well as at Station No. 3, some 450 miles up the line at Tok Junction . . . Wilson-Snyder Quintuplex Plunger Pumps were selected because only reciprocating, positive-displacement pumps can handle both light and heavy liquids, at wide viscosity and pressure variations, in summer and winter temperatures, at uniformly high efficiency.

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MAINTENANCE—Horizontal pump construction with large stuffing box openings affords ready access for packing adjustments. Two-piece plunger construction facilitates installations of new packing when needed and plungers can be serviced separately. A combination splash and pressure system supplies ample lubrication to all power end working parts.

WHEN PUMPING PROBLEMS . . . are being analyzed, give your nearest "Oilwell" Pump Specialist an opportunity to quote on Wilson-Snyder pumps that will meet your requirements . . . . MOST ECONOMICALLY

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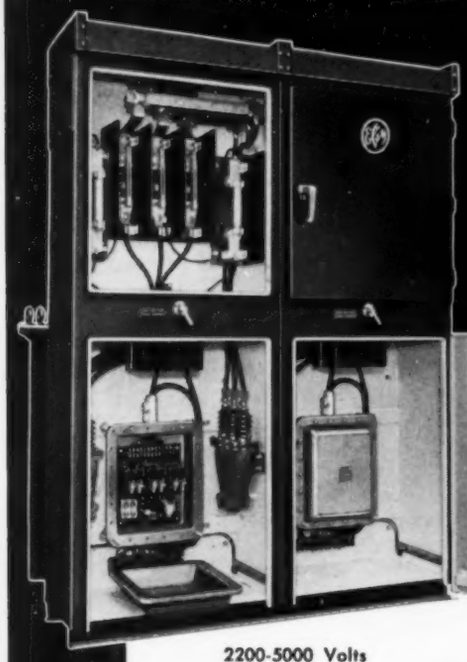

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Petroleum engineers specify these Starters for Division 2 semi-hazardous locations because they assure substantial savings in installation and operation.

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EC&M 2200-5000 volt Starters are also available in Totally Oil-immersed Division 2 Style and in Division I style. Both are available with Oil Disconnect Switch (for main line).

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2. Low-cost Div. 2 design
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10. Self-contained bus and pot-heads are optional

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SUBSCRIPTIONS

R. M. deSombre, Circulation Manager, P. O. Box 2608, Houston, Texas, U. S. A.
Price of this issue $1.

Double price for single copies more than a year old. Subscription price: domestic and foreign $2 a year; 2 years, $3; 3 years, $4. Subscription restricted to those engaged in the pipe line branch of the oil and gas industry, or the manufacturing and distribution of pipe line equipment.

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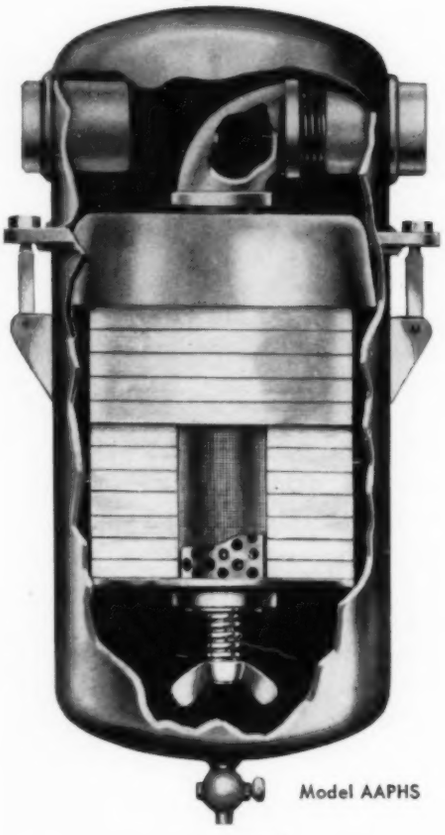

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At this time of year—when the humidity is high—your compressed air lines carry lots of water . . . water that can rust and clog your equipment, ruin your work, or shut down your boilers.

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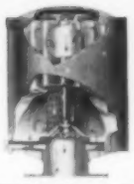

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You can start increasing your work speed and profits immediately. Call your nearby Caterpillar Dealer. He will demonstrate the new, improved MD7 at your convenience on *your* job.

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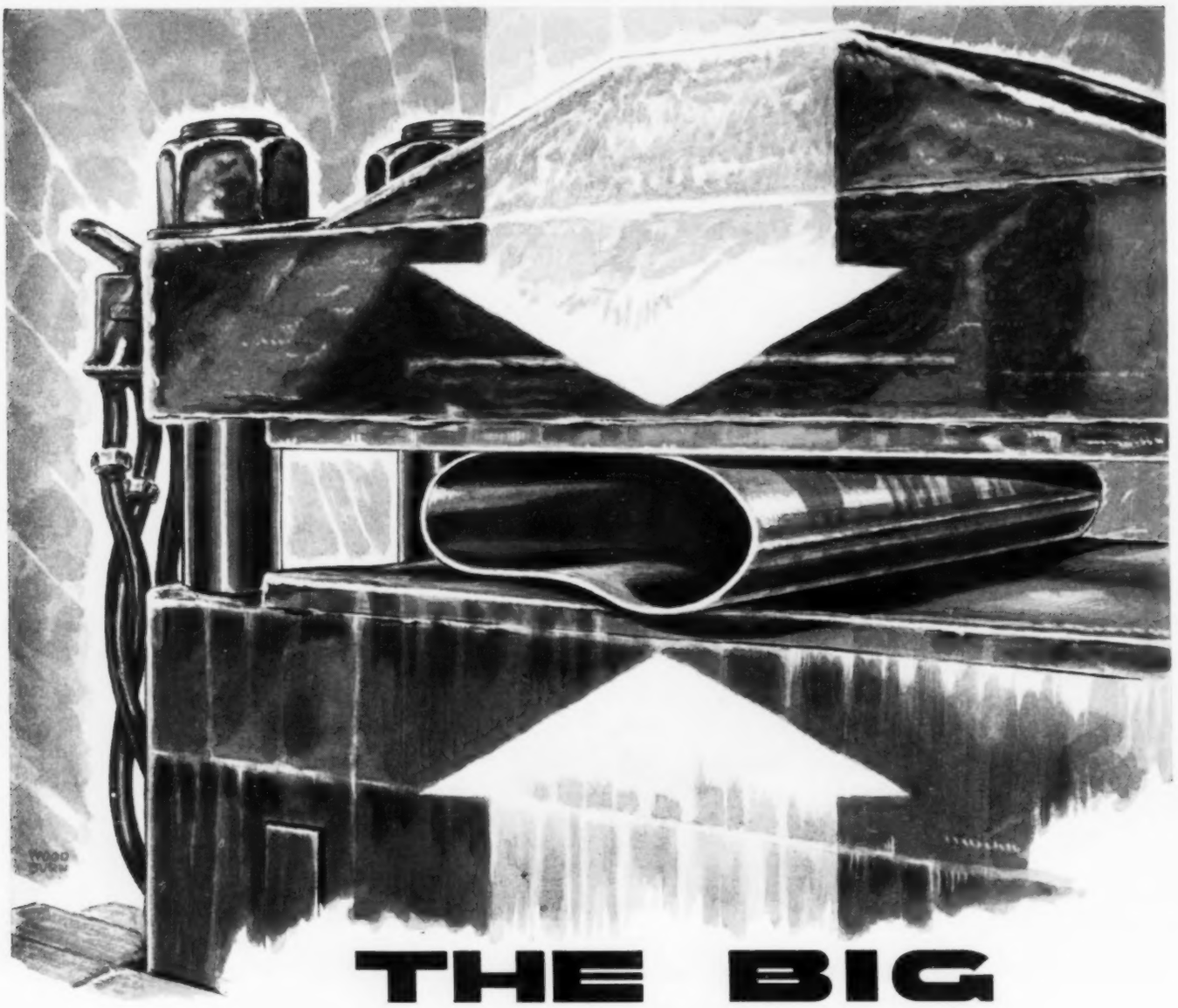

THE BIG SQUEEZE

The "big squeeze" is one of many tests to which Youngstown Electric Weld Line Pipe is subjected, to assure you a top quality product. In our process both ends of each length are cutoff and crush-tested in a massive press.

Each end section of the pipe is positioned in the press so that the weld receives the maximum effect of a steady crushing action of thousands of pounds pressure. In the "big squeeze" the weld holds fast—stronger even than its parent metal. Then the pipe continues through subsequent operations and further tests — — PROVEN and READY for efficient service in the field.

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Five reasons why Youngstown Electric Weld Line Pipe is your best buy: (1) It bends readily; (2) Wall thickness is uniform; (3) Line up characteristics are excellent; (4) Weldability is outstanding; (5) Long lengths save you time and trouble. The Youngstown Sheet and Tube Company, Youngstown 1, Ohio. Sales and service offices throughout the oil and gas producing areas.

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Three Brodie Meters, each with 1800 bbl/hr capacity, are shown at the Watson station. Additional Brodie Meters are at Norwalk, Phoenix, Colton and Niland.

Brodie Meters on new 844-mile products line point up efficiency, control, and accurate records

On the new Southern Pacific Pipe Lines, Inc. installation between Los Angeles and El Paso, Brodie BiRotor Meters at western segment pumping stations and distribution take-off points are employed to provide accurate measurement and records of various products. The 8" to 16" line was designed by Engineering Management Inc.

The Watson, California station pictured above illustrates use of the Brodie Dual Counter System. This allows instant switching from one counter to another without stopping flow between tenders or product changes. The operator can then print the record of the previous tender at his convenience. This is typical of modern methods employed throughout this $30 million products line—the first built by a railroad—and first to carry products out of California.

Sustained accuracy and low maintenance is daily proving the advantages of Brodie BiRotors —wherever petroleum is metered.

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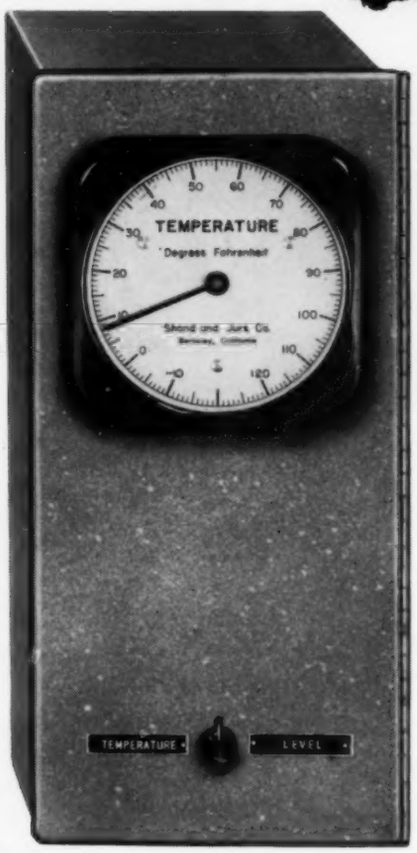
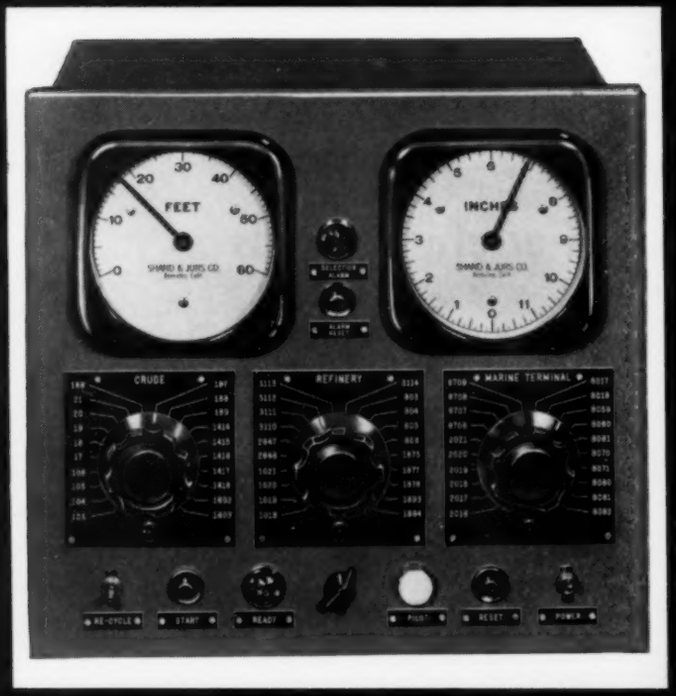
The New Telepulse Temperature System is illustrated and described in Bulletin TT-456, while the Telepulse Remote Reading Gaging System is covered in Bulletin T-455. Please write for a copy of either or both bulletins if you are seriously interested in Remote Readings of levels or temperatures.



Above, the Telepulse Temperature Indicator, encased in a steel cabinet finished in crackle grey and of dimensions to mate perfectly with the Telepulse Level Reading Unit in size and finish, so that both may be installed side by side in an instrument panel.



The illustration at the left shows the Telepulse Remote Reading Gaging System, which gives accurate tank gage readings of distant storage in feet, inches and eighths of inches.

Shand and Jurs Co.
BERKELEY 10, CALIFORNIA

NEW YORK
342 Madison Ave.

HOUSTON
M & M Bldg.

TULSA
Thompson Bldg.

CHICAGO
10409 S. Western Ave.

LOS ANGELES
6399 Wilshire Blvd.

REPRESENTATIVES:
SEATTLE: Nebar Supply Company, 3000 Western Avenue
MONTREAL: Lytle Engineering Specialties, Ltd., 360 Notre Dame St., W.
TORONTO: Lytle Engineering Specialties, Ltd., 69 Eglinton East
VANCOUVER: P. D. McLaren & Son, Ltd., 3277 Main Street
CALGARY: P. D. McLaren & Son, Ltd., 510 - 9th Ave. W.
MEXICO, D.F.: Dalmar Comercial, S. A.
CARACAS: Sinclair Spence, C.A., Edificio Galipan
ENGLAND: Whessoe, Ltd., Sales: 25 Victoria St., London S. W. 1
Whessoe, Ltd., Works: Darlington, County Durham

Announcing

TWO GREAT EVENTS FOR MAY 17TH

THE CONSOLIDATION OF THREE GREAT COMPANIES

W-K-M Manufacturing Company, Inc., ACF Valve Division and the Key Company — all members of the ACF Industrial Family — have been brought together as W-K-M Manufacturing Company, a subsidiary of ACF Industries, Inc.

Management, Manufacturing and Marketing facilities of all three are now centralized in this new 12-acre completely air-conditioned office and plant at Missouri City, Texas, a few miles west of Houston.

This consolidation provides important efficiencies of production of W-K-M Through-Conduit Valves, ACF Lubricated Plug Valves, Key Return Bends, and Key-Kast Welding Fittings. These products, with a long established reputation for excellent service and performance, will continue to be engineered, manufactured and sold by the same experienced personnel who were instrumental in building that reputation.

OPENING OF A GREAT NEW PLANT THURSDAY, MAY 17TH TWO to SEVEN P. M.

You are cordially invited to inspect our new Plant and Office at Missouri City, Texas, just a few miles west of Houston.

Special transportation from downtown Houston to the plant will be provided for visitors. Please write immediately for your Transportation Pass. Address W-K-M Manufacturing Company, Guest Committee, P. O. Box 2117, Houston, Texas.

W-K-M MANUFACTURING COMPANY, INC.

A SUBSIDIARY OF ACF INDUSTRIES INCORPORATED

PLANT: MISSOURI CITY, TEXAS • MAILING ADDRESS: P. O. BOX 2117, HOUSTON, TEXAS

MANUFACTURING

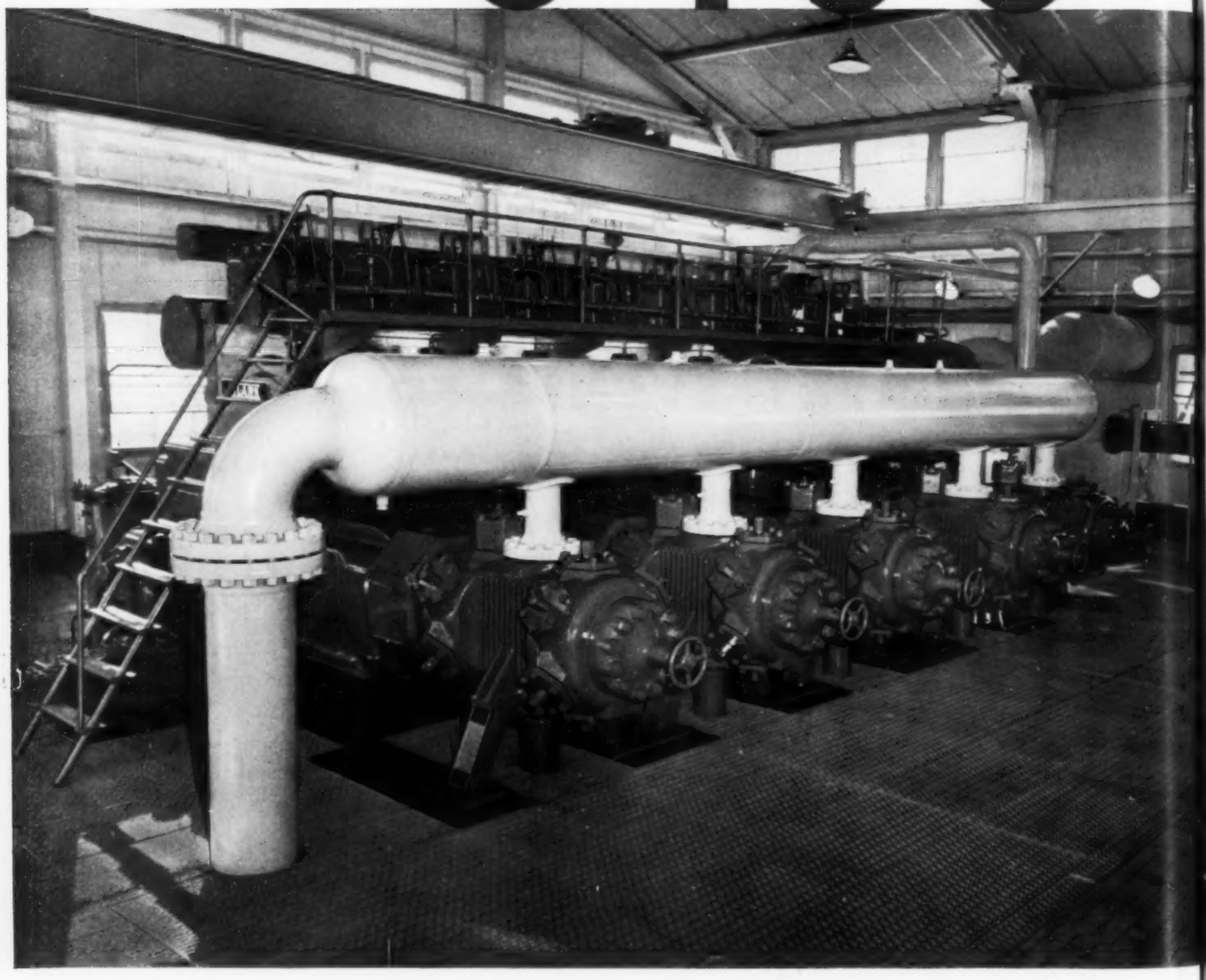
W-K-M THROUGH-CONDUIT GATE VALVES

ACF LUBRICATED PLUG VALVES

KEY RETURN BENDS AND FITTINGS

For more data on advertised products, use Readers' Service Cards, last page.

3400



horsepower ≠

Most Powerful Gas-Engine-Driven Compressor Ever Built*, Delivered by Clark in 4½ Months

Michigan Gas Storage needed a substantial block of compressor horsepower at their Freedom Station in Southern Michigan and they needed it in a hurry. The problem was to build up enough underground gas reserves to meet anticipated heavy winter demands.

They had plenty of station flexibility because of the 12 Clark BA compressors already operating. Therefore, one big unit seemed to be the least costly and the fastest to install. A Clark Turbo-supercharged Model TLA-10 would develop the horsepower required. The efficiency guaranteed by Clark would also mean considerable savings in operating costs.

At the time the need became evident, a Clark TLA-10 had never been built. Nevertheless, Clark promised to build, test and ship this 150 ton unit, including the special turbocharger, in 4½ months or less. The promise was kept and Michigan Gas Storage met their commitments.

For your big jobs, where large amounts of horsepower are required, the big TLA models will really save money before and after installation. For the somewhat smaller installations or those requiring more flexibility, Clark has other Turbo-supercharged models that are equally efficient although less powerful. Eight sizes in the 1100—3400 BHP range are available. Your nearest Clark office will be pleased to furnish you with complete information, or write for bulletin No. 134.

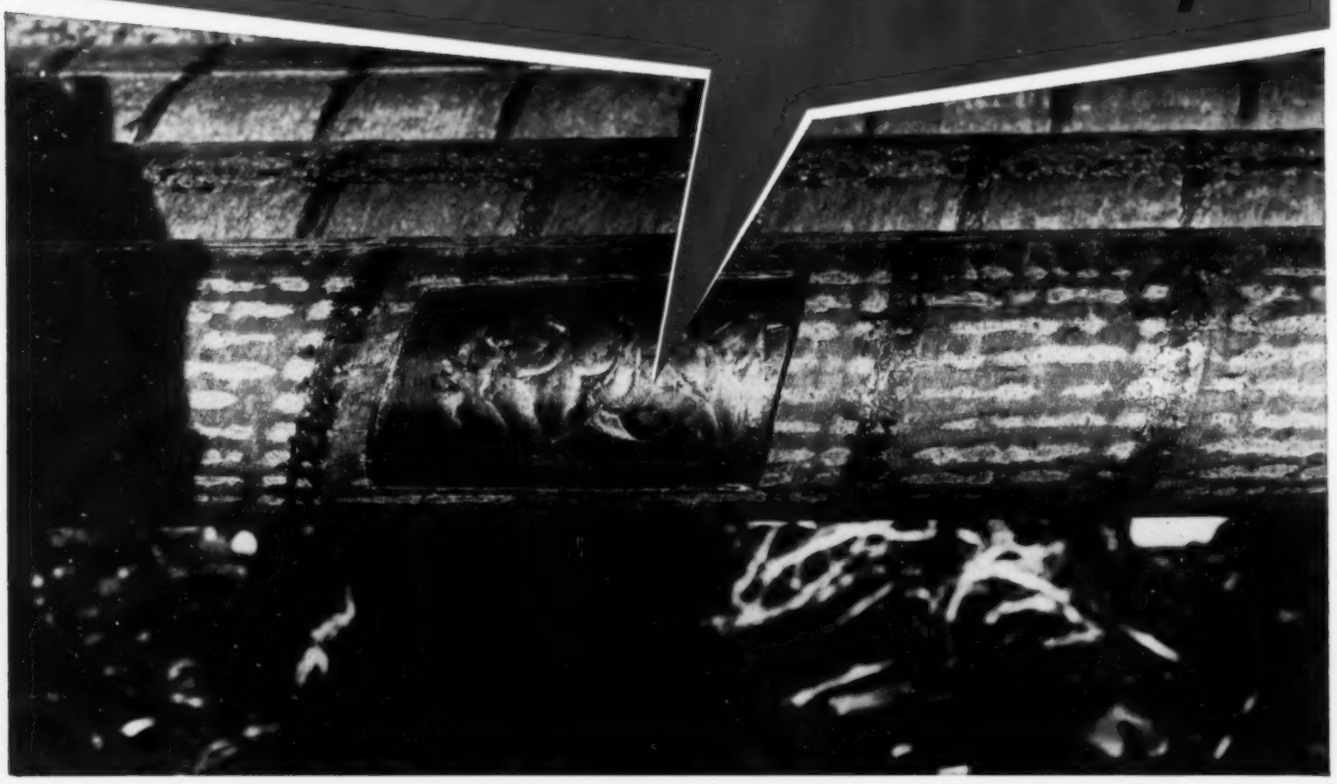
**The TLA-10 operated by Michigan Gas Storage Company is rated at 3300 BHP. Latest models are rated at 3400 BHP.*

CLARK BROS. CO., OLEAN, N. Y.
One of the Dresser Industries
Offices in principal cities throughout the world.

CLARK® — ONE OF THE DRESSER INDUSTRIES®

Turbo-Supercharged Compressors

Will Your Pipeline Look This Good 20 Years from today?



Here's Proof that COAL TAR Coatings Last Far Longer, Cost Far Less in the Long Run!

THIS pipeline was laid many years ago. But when it was unearthed for inspection, it showed no sign of failure or deterioration—thanks to its coal tar coating, *the most dependable material ever developed for commercial pipeline protection.*

Other materials come and go, but only coal tar coatings continue to offer such concrete, *time-tested* proof of their unique ability to resist soil stress and water absorption.

Why risk the chance of costly failures with "economy" coatings? Specify Pitt Chem *Coal Tar* Coatings and be *sure* of economical, long-lasting protection. For Pitt Chem Coal Tar Coatings are manufactured to rigid *published* specifications to give you assured protection with every drum. How can we help *you?* Send us the details of your coating problem.

PITT CHEM® TAR BASE COATINGS

- Standard Grade
- Modified Grade
- Plasticized Grade
- Hotline
- Cold Applied Tar Base Coatings

WSW 6015

COAL CHEMICALS • PROTECTIVE COATINGS • PLASTICIZERS • ACTIVATED CARBON • COKE • CEMENT • PIG IRON

THERE'S AN INSLEY WORKING NEAR YOU

on a pipeline project

Pipeline contractors know Insley is a thoroughly dependable performer, capable of maintaining maximum output regardless of the type of terrain. Put Insley's pipeline experience to work for you—Let your Insley distributor show you "an Insley at work."

Excavators and cranes, 5 to 35 ton capacity—rubber or crawler mounted—gasoline, diesel or electric power.

INSLEY MANUFACTURING CORPORATION • INDIANAPOLIS, INDIANA
wholly owned subsidiary THE MAXI CORPORATION • LOS ANGELES

Enough to run a pipe line from San Francisco to London

THE gas and petroleum transmission industries can take great pride in the gigantic jobs they've completed in recent years.

As a major supplier of large diameter steel line pipe, Kaiser Steel has been privileged to play an important part in these vast undertakings. In five years, enough line pipe of various diameters has been shipped from our Napa, California plant to run a pipe line from San Francisco to London.

Shown below is a partial list of major customers, who have used Kaiser Steel Line Pipe in scattered locations from New York to California, from Canada to Mexico.

CITIES SERVICE GAS CO.
NORTHERN NATURAL GAS COMPANY
PANHANDLE EASTERN PIPE LINE CO.
SINCLAIR PIPE LINE CO.
INTERPROVINCIAL PIPE LINE CO.
OKLAHOMA NATURAL GAS CO.
PLATTE PIPE LINE CO.
NATURAL GAS PRODUCERS, INC.
THE MONTANA POWER COMPANY
COLORADO INTERSTATE GAS CO.
ARAPAHOE PIPE LINE CO.
TRANS MOUNTAIN OIL PIPE LINE CO.
MOUNTAIN FUEL SUPPLY CO.
SOUTHERN UNION GAS CO.
EL PASO NATURAL GAS CO.
PACIFIC GAS & ELECTRIC CO.
STANDARD OIL COMPANY OF CALIFORNIA
UNION OIL COMPANY OF CALIFORNIA
RICHFIELD OIL CORPORATION
SOUTHERN COUNTIES GAS CO.
TIDE WATER ASSOCIATED OIL COMPANY
SOUTHERN CALIFORNIA GAS COMPANY

Kaiser Steel

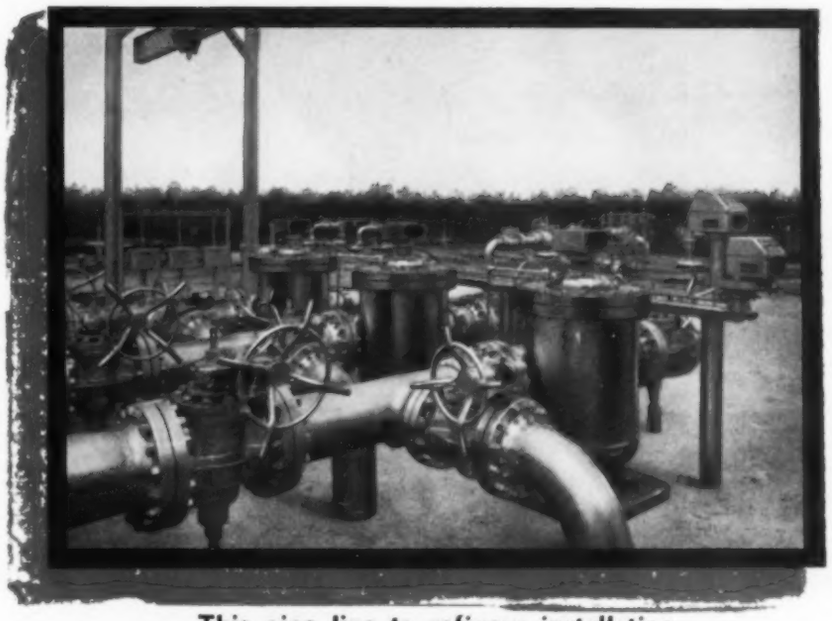
GULF OIL CORPORATION
GULF REFINING COMPANY
PHILLIPS PETROLEUM CO.
PHILLIPS PIPE LINE CO.
TENNESSEE GAS TRANSMISSION CO.
THE TEXAS PIPE LINE COMPANY
PIONEER NATURAL GAS COMPANY
TRUNKLINE GAS COMPANY
TRANSCONTINENTAL GAS PIPE LINE CORP.
TEXAS EASTERN TRANSMISSION CORP.
UNITED GAS PIPE LINE COMPANY
ASIATIC PETROLEUM CORPORATION
THE PURE OIL COMPANY
SINCLAIR OIL CORPORATION
SHELL PIPE LINE CORPORATION

Steel Mill Products: plates • hot rolled strip and sheet • cold rolled strip and sheet • tin plate • continuous weld pipe • electric weld pipe • alloy and carbon bars • bar shapes • structural shapes semi-finished steels • pig iron • ingot molds • coke by-products • **Fabricating Division:** steel fabrication for construction, aircraft, missile and other industries • expanded fusion weld pipe reinforced concrete pipe • tanks • For specifications, write: **KAISER STEEL CORPORATION** • **Los Angeles** • **Oakland** • **Seattle** • **Portland** • **Phoenix** • **Denver** • **Tulsa** • **New York**

MECO Integrated SERVICE

SAVES TANKAGE

MECO'S engineering service teamed with advanced equipment result in profitable use of three 10" Smith crude oil meters with the total throughput of all meters combined to print a single ticket for the total tender.



This pipe line to refinery installation includes 4", 6" and 10" meters.

with SMITH METERS

SAVE TANKAGE. This battery of Smith positive displacement meters has saved the large expenditure necessary for tankage by allowing incoming crude to flow directly to the stills.

HIGH % ACCURACY. Based on several years experience these meters have consistently maintained greater accuracy than obtained by the conventional tank gaging method.

LARGE VOLUME. 10" Smith meters in this installation have streamlined the handling of crude oil to this refinery, resulting in reduced evaporation losses and measurement costs.

For detailed information, write, wire or phone:

OFFICES: Corpus Christi, Texas*
Dallas, Texas
Shreveport, Louisiana

MECO MAINTENANCE Engineering CORPORATION
P. O. BOX 2637 — PHONE CA 2-2351
3711 CLINTON DRIVE — HOUSTON 20, TEXAS

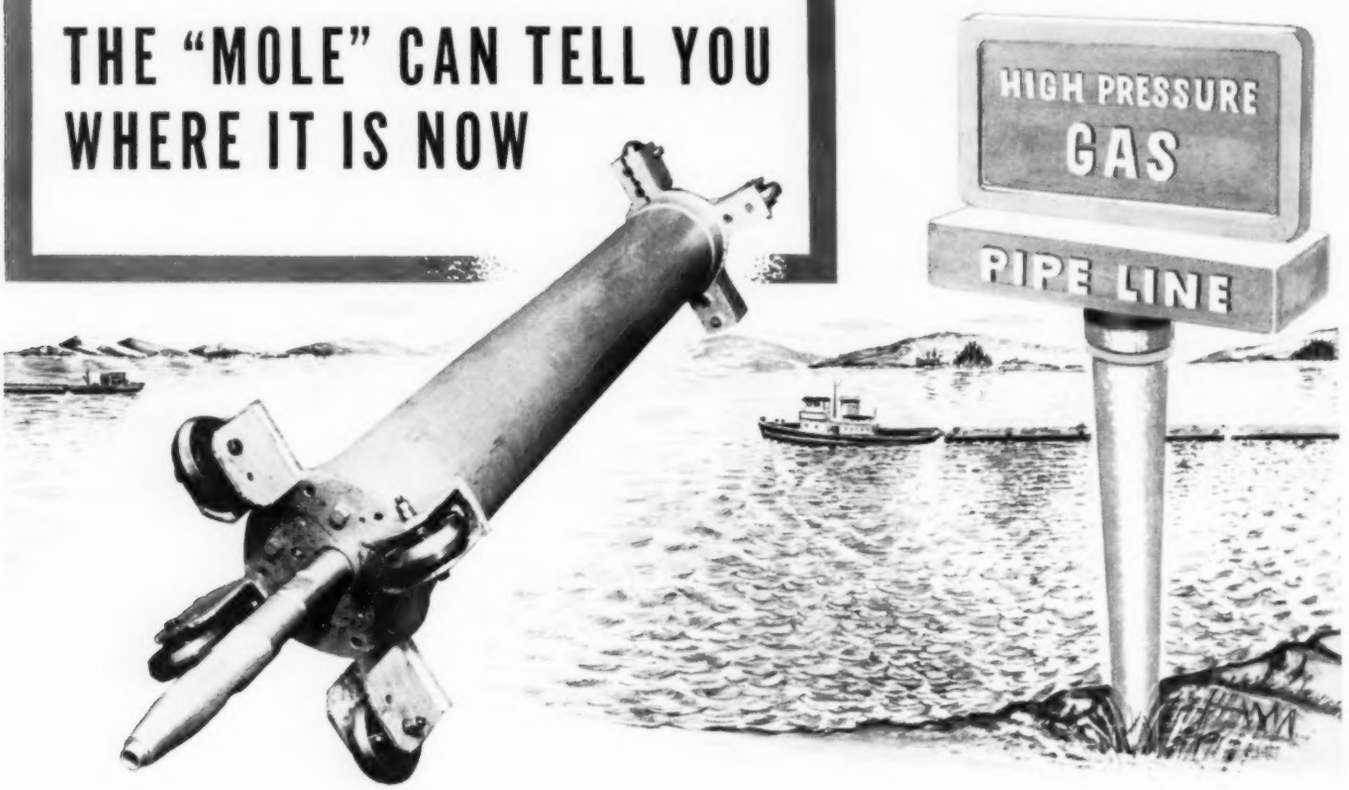
SUBSIDIARIES: Coastal Engineering Corporation*
New Orleans, Louisiana
Proveedores Tecnicos, S. A.*
Mexico D. F., Mexico

*Warehouse stocks maintained

For more data on advertised products, use Readers' Service Cards, last page.

IS THAT LINE EXACTLY WHERE YOU PUT IT?

THE "MOLE" CAN TELL YOU WHERE IT IS NOW



BESIDES LOCATING RIVER CROSSINGS EXACTLY, THE "MOLE" MAY GIVE ANSWERS TO THESE QUESTIONS:

Has the line shifted?
How much has it moved?
Does a line shift gradually?
What makes a line break?
Is the negative buoyancy ample?
Is the line swinging?
How many feet of line is bare or covered?
How deep is the cover?
Is the line safe?

The "Mole" is a three dimensional pipeline surveying unit making photographic film recordings ordinarily every 40' to 50' during 25-second stops. Surveys are made of both directions of the line. After the survey is run, the film developed, and data recorded, the survey is computed with IBM machines.

The dimensions of the "Mole," 66" overall by 7¾" diameter, allows it to be used in flat 10" lines, most 12" lines, and any 14" or larger lines with only cold field bends. "Mole" surveys have ranged from 1500' to 9000', one way, with good results in each survey.

Write for complete information on the "Mole" that can tell you exactly where your pipeline is now.

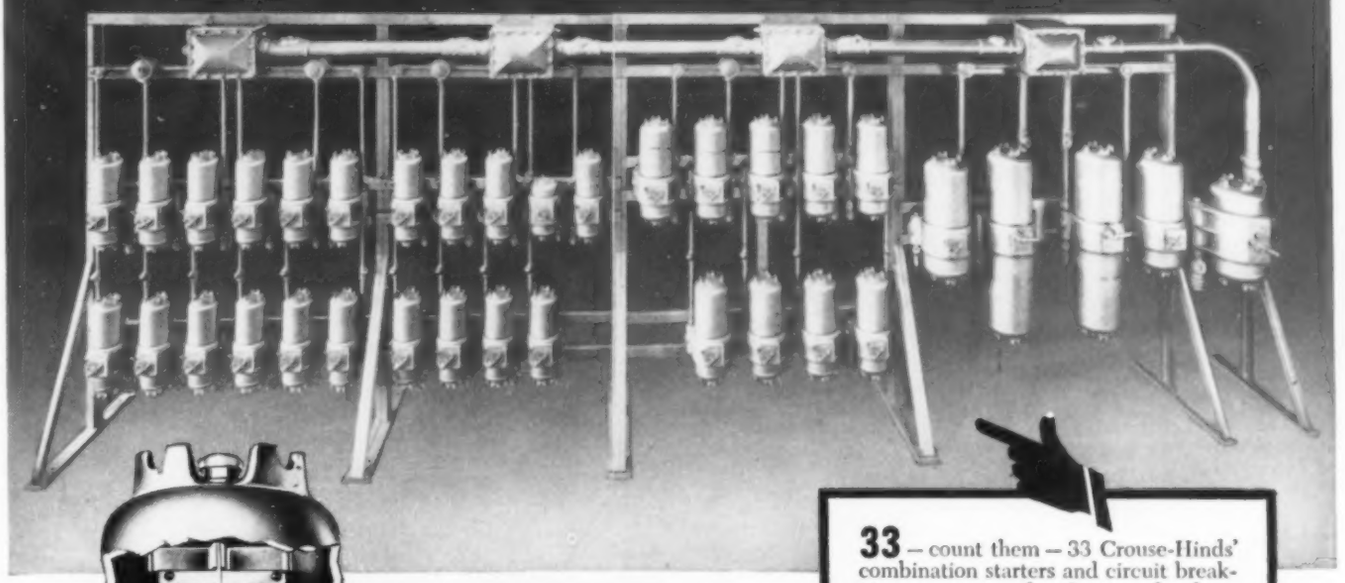
SPERRY-SUN WELL SURVEYING COMPANY

3118 BLODGETT AVENUE • HOUSTON, TEXAS

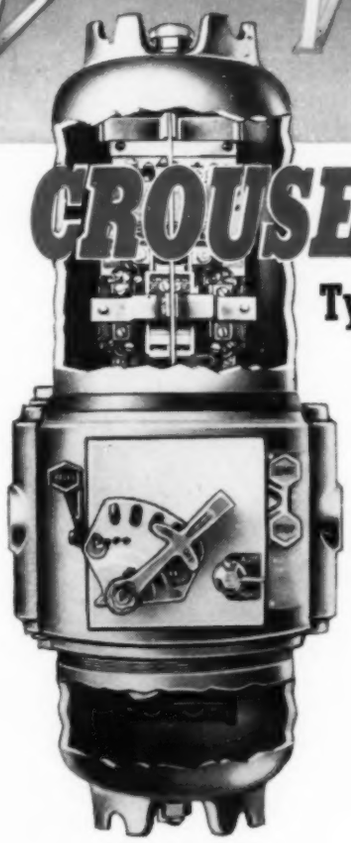
BRANCH OFFICES

Corpus Christi, Odessa, Marshall, Wichita Falls, Texas • Lafayette, Westwego, La. •
Long Beach, Bakersfield, Ventura, Calif. • Oklahoma City, Okla. • Casper, Wyoming

Need more motor controls BUT... haven't enough room?



33 – count them – 33 Crouse-Hinds' combination starters and circuit breakers . . . space for 2 more for later installation . . . plus 2 circuit breakers —all in 28' x 10' of space! Conventional single-tiered installation would have required 20 ft.-longer rack and 4 more junction boxes.



CROUSE-HINDS

Type EPC Explosion-Proof MOTOR STARTER and CIRCUIT BREAKER

CONDULETS* take up less space!

As in the installation shown above, a given area will hold *more* Crouse-Hinds' motor controls than any other make. You save money on the construction of steel mounting racks – fill your needs without occupying additional premium floor space.

- Explosion-proof, dust-tight, weather-resistant.
- Light-weight cast aluminum for easy installation without lifting equipment.
- Flame-tight threaded joints throughout.
- Seven conduit entrances simplify installation.
- Built-in push button stations and built-in selector switch available.
- Starter sizes 0 to 5. Circuit breakers 50 to 600-amp. frame sizes.

Let Crouse-Hinds help you solve your space problems.
Engineering assistance available without obligation.

*CONDULETS are made only by CROUSE-HINDS

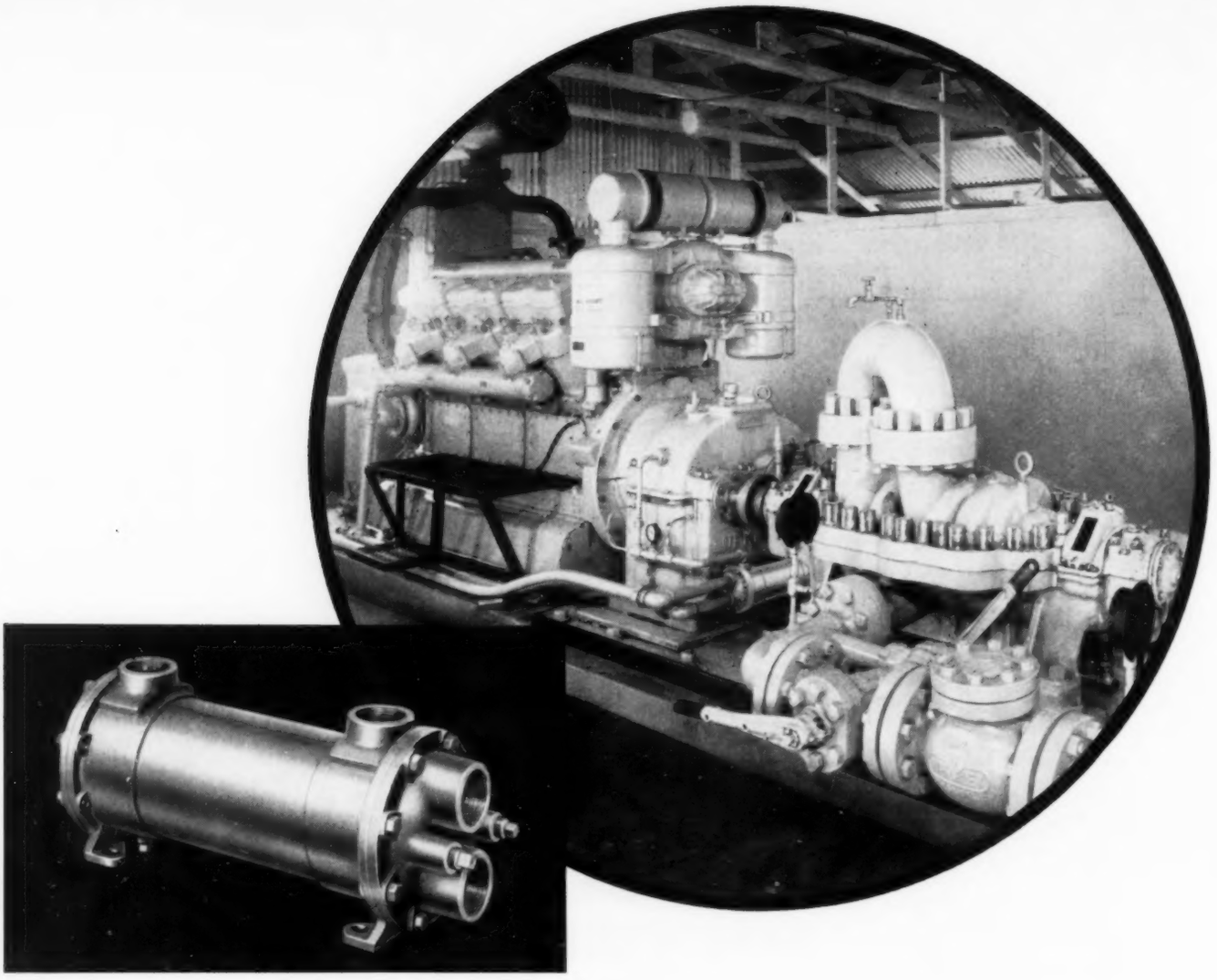
A NATIONWIDE DISTRIBUTION exclusively through ELECTRICAL DISTRIBUTORS

CROUSE-HINDS COMPANY

SYRACUSE 1, N. Y.

OFFICES: Birmingham Boston Buffalo Chicago Cincinnati Cleveland Dallas Denver Detroit Houston Indianapolis Kansas City Los Angeles Memphis Milwaukee New Orleans New York Philadelphia Pittsburgh Portland, Ore. St. Louis St. Paul San Francisco Seattle Tulsa Washington RESIDENT REPRESENTATIVES: Albany Atlanta Baltimore Baton Rouge Charlotte Chattanooga Corpus Christi Reading Pa Richmond Va Shreveport
Crouse-Hinds Company of Canada, Ltd Toronto, Ont

CONDULETS • FLOODLIGHTS • TRAFFIC SIGNALS • AIRPORT LIGHTING



ROSS EXCHANGERS

extend engine and oil life of this "round the clock" Caterpillar Diesel

Driving a centrifugal pump, at a 1000-barrel per hour rate, this Caterpillar Diesel Engine runs 24 hours a day, 30 days a month, the year around at a Texas pipeline pumping station.

To assure continuous, trouble-free lubrication and correct operating temperatures, Caterpillar installed two Ross Exchangers as standard equipment. One delivers an adequate supply of properly cooled lube oil to moving parts of the engine, while the other cools the jacket water . . . lengthening both engine and oil life.

Ross Exchangers are used extensively throughout the pipeline industries because of their high thermal efficiency and extreme ruggedness . . . in fact, in every industry where controlling lube oil, jacket water or hydraulic fluid temperature is necessary for the operating efficiency of machinery.

They are completely pre-engineered and fully standardized in a wide range of sizes.

Bulletin 1.1K5 will give you detailed information. Write. Ross Heat Exchanger Division of American-Standard, 1450 West Avenue, Buffalo 13, New York. In Canada: Kewanee-Ross of Canada Limited, Toronto 5, Ont.

ROSS HEAT EXCHANGER PRODUCTS

ROSS

EXCHANGERS

No Shortage of Engineers Here!

The engineering and design of modern pipe line systems is highly complex and requires the specialized skills of experts. To provide the finest and most complete pipe line engineering, we have assembled professional engineers with proven records in all phases of the many services we offer. Market analysts, right-of-way agents, purchasing agents, accountants, and business executives supplement the engineering personnel. The combined background of these people totals more than 300 years experience on major crude oil, products, and gas pipe line systems. When consulting Pipe Line Technologists you are assured that your pipe line problems will be handled by professional engineers and specialists exceptionally qualified to provide a thorough service at a minimum cost. Let us put our service to work for you!

PL TECHNOLOGISTS

PIPE LINE TECHNOLOGISTS

Crude Oil • Natural Gas • Products Pipe Lines

Home Office: 2518 North Boulevard, P. O. Box 6957, Houston • **Phone** JAckson 6-1221
Branch Offices: 80 Broad Street, New York • Phone Digby 4-1949
309 Seventh Avenue, Calgary, Alberta, Canada • Phone 6-6809

For more data on advertised products, use Readers' Service Cards, last page.

Do You Know

What Topaz Can Do For You?

Topaz is a sales and service organization offering you complete lines of nationally recognized pipeline supplies and equipment plus the consulting and supervisory services of experienced engineers. You can call Topaz night or day, with assurance that your needs will receive prompt personal attention.

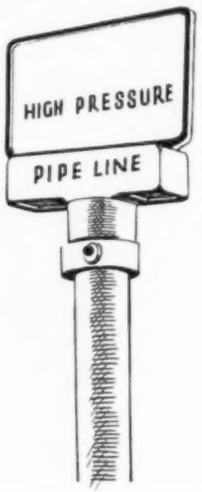
Hot Tapping

Topaz* sales engineers plan and supervise** hot tapping operations on gas, steam, water, products and chemical lines without costly shutdown. Hot tapping equipment may be contracted, leased or purchased. Topaz service includes consultation, supervision and instruction of company field personnel on use of purchased equipment.

**Agent for T. D. Williamson, Inc.*
***In Cooperation with T. D. Williamson, Inc.*

L & M Marker-Vents

L & M Marker-vents on highway and railroad casing vent pipes have proved both effective and economical. Less expensive than a field-welded vent hood, the aluminum alloy L & M Marker-vent will last the life of the line. Custom designed sign panels with your company name and emblem are available in your choice of colors. Sizes available for 2", 3" and 4" pipe. L & M products, distributed by Topaz* also include standard safety signs, well markers and aerial view markers.



**Sole distributor for L & M products.*

Consulting, Engineering and Supervision

Working in cooperation with engineering departments, Topaz sales engineers perform flow condition analyses, pigging, stopple application, inspection and line testing. All equipment for these operations may be leased, contracted or purchased through Topaz.

Cathodic Protection

All cathodic protection equipment and supplies, including rectifiers, anodes, coke breeze, pipe wrap and pipe coatings are available from one supplier . . . Topaz*. This means savings to you in time and paper work.

**Agent for The Holcombe Co., Inc.*

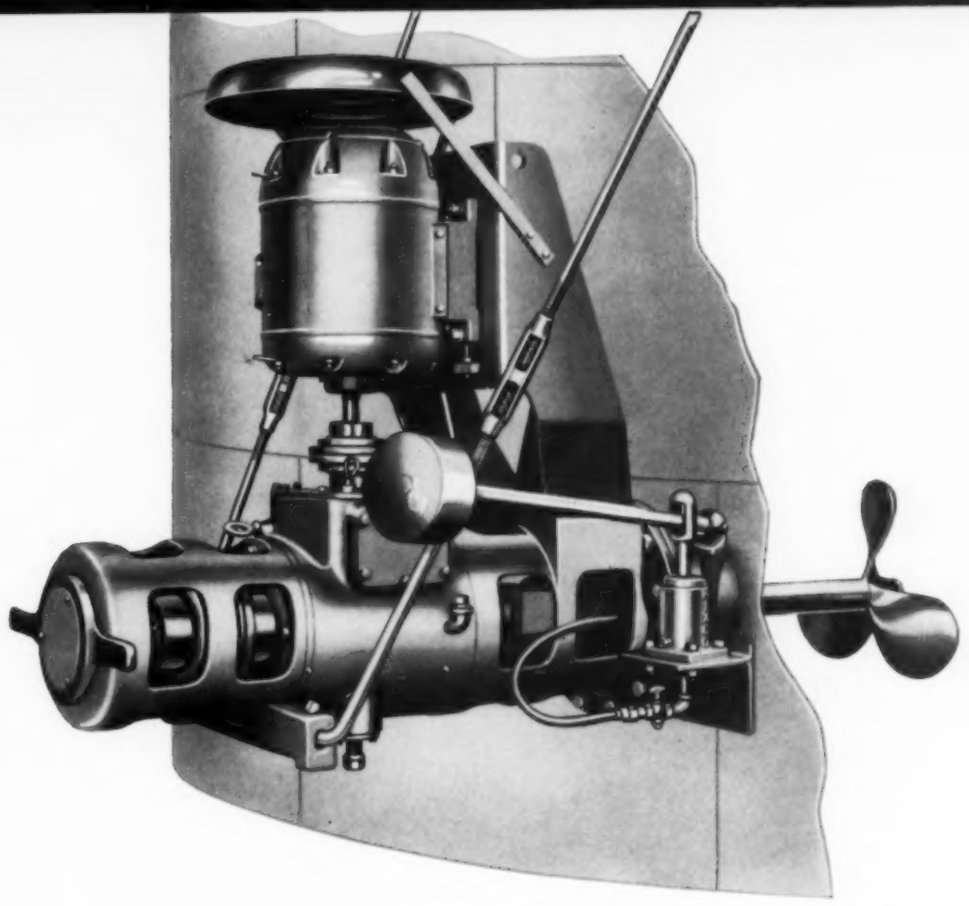
Other supplies available from Topaz:

- valves
- pipe cutting machines
- cutting and beveling machines
- odorizers
- clamps, hooks and dollies
- pipe saddles and reducers
- heavy machines
- torches
- Plus all other equipment or supplies necessary to complete your project.

Tod Pazdral *Pipeline Specialties*

ToPaz

2525 South Boulevard Houston, Texas Office Phone: JA 2-1403
Tod Pazdral Consulting and Supervision Home Phone: MA 3-5680



Sweep up EXTRA DOLLARS *off your tank bottoms*

You may save $1,000 a year controlling sludge this easy way

Don't let BS&W rob you of profits that should—and easily can—be yours.

It doesn't cost money to keep crude oil tanks clean by flipping a switch. It *pays.* Careful field tests, by a large pipe line company, show a direct, traceable saving of *$1,000 per tank per year.*

This figure indicates what you can save just by eliminating the costly job of cleaning out bottom sediment.

Tanks work harder, too

In addition, your tankage works at full efficiency when you need it. You add as much as 12% more tank capacity, without adding a single tank. You need never disrupt normal dispatching because tanks are "down" for cleaning.

You eliminate settling of refinable oil and wax. This can run as high as 4,000 barrels, in a 120-foot tank with 2-foot level of sludge. And you minimize the chances of corrosive sludge chewing holes around the tank bottom.

To get these savings, more than 50 independent pipe line companies and 35 leading producers and refiners choose LIGHTNIN Mixers for crude oil sediment control.

Simplest maintenance possible

You save more with LIGHTNINS, because maintenance is extra-easy. LIGHTNINS are built so they can *never* get out of alignment. Repacking is fast and simple, even with the tank full.

And for even bigger savings on upkeep, you can get the LIGHTNIN cartridge-type rotary seal that ends stuffing-box repacking forever.

You can get LIGHTNINS in a full range of sizes, from 1 to 25 HP, easily installed on old or new tanks.

Wouldn't you like to have specific facts on what *you'll* save with LIGHTNIN Mixers on your tanks? Your LIGHTNIN representative can give you these facts. You'll find him listed in Composite Catalog. Or write us today.

Left: **FASTER SERVICING.** You can repack a LIGHTNIN stuffing box from outside a full tank, without losing a pint of liquid. Shutoff device is out in the open, easy to get at.
Right: **NO REPACKING** with this cartridge seal (optional on LIGHTNIN Mixers). It takes the place of a stuffing box; stops leakage; runs for years without adjustment; comes out in one piece for easy, rapid replacement if ever necessary.

Lightnin® Mixers

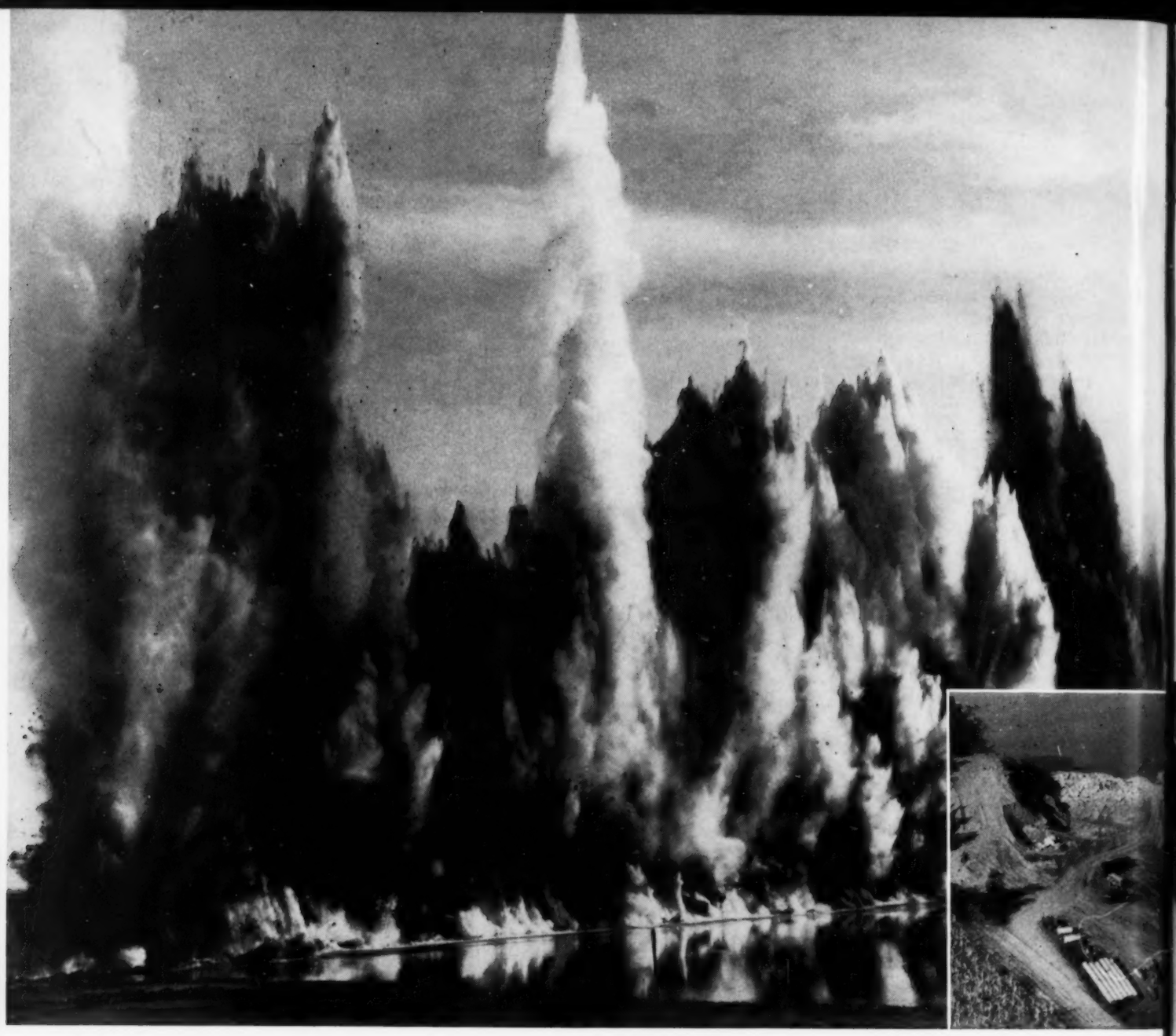
MIXCO fluid mixing specialists

Get ***these helpful bulletins*** on BS&W control and LIGHTNIN Mixers. Check, tear out and mail to us today with your name and company address. Free—no obligation.

- ☐ B-503 BS&W Control with LIGHTNIN Mixers
- ☐ B-104 Side entering mixers. 1 to 25 HP
- ☐ B-107 Data sheet for figuring mixer requirements
- ☐ B-110 Condensed catalog describing LIGHTNIN Mixers —all types
- ☐ B-111 LIGHTNIN rotary mechanical seals for extra-low-cost mixing

MIXING EQUIPMENT Co., Inc., 196-e Mt. Read Blvd., Rochester 11, N.Y.

In Canada: Greey Mixing Equipment, Ltd., Toronto 10, Ont.



WHEN PIPELINES CROSS WATER explosives research pays off

The tremendous power of dynamite, skillfully and ingeniously handled, made it economically possible to cross the wide, deep Tennessee River (inset above) with two parallel pipelines, 50 feet apart. Trenches blasted underwater through hard red clay in the shallows, and lime rock in the 40-foot-deep channel, opened the way for speedy dredging operations . . . another example of the efficiency of modern explosives and blasting methods.

Hercules' research in the pioneering and development of explosives and our extensive service facilities are available to help you in solving blasting problems on construction jobs or in mining and quarrying operations.

Explosives Department

HERCULES POWDER COMPANY

INCORPORATED

939 Market St., Wilmington 99, Del.

Birmingham, Ala.; Chicago, Ill.; Duluth, Minn.; Hazleton, Pa.; Joplin, Mo.; Los Angeles, Cal.; New York, N. Y.; Pittsburgh, Pa.; Salt Lake City, Utah; San Francisco, Cal.

R54-6

Maloney FLANGE INSULATION

NEOPRENE FACED GASKETS

Maloney PIPE LINE SCRAPER CUPS

"Something from the Irishman"

Maloney insulating sets, consisting of a central gasket, sleeves and washers, have become the standard in the cathodic protection field. They are designed to operate at the ASA rating of the flange at normal temperatures. Maloney also manufactures insulation out of special materials for higher temperatures. Complete sets are shipped in individually marked cartons.

Maloney scraper cups are ideal for service in out-of-round and varying weight pipe. The heavy lip wears evenly and gives longer effective life. Maloney scraper cups are manufactured from a selected Neoprene compound, have excellent abrasive qualities, proper flexibility and retain dimensional stability under all service conditions.

F. H. MALONEY *Company*

Houston, Texas

2301 TEXAS AVE. • FAirfax 3-3161

HOUSTON • LOS ANGELES • TULSA

SINCE 1932 PRECISION IN RUBBER - METAL - PLASTICS

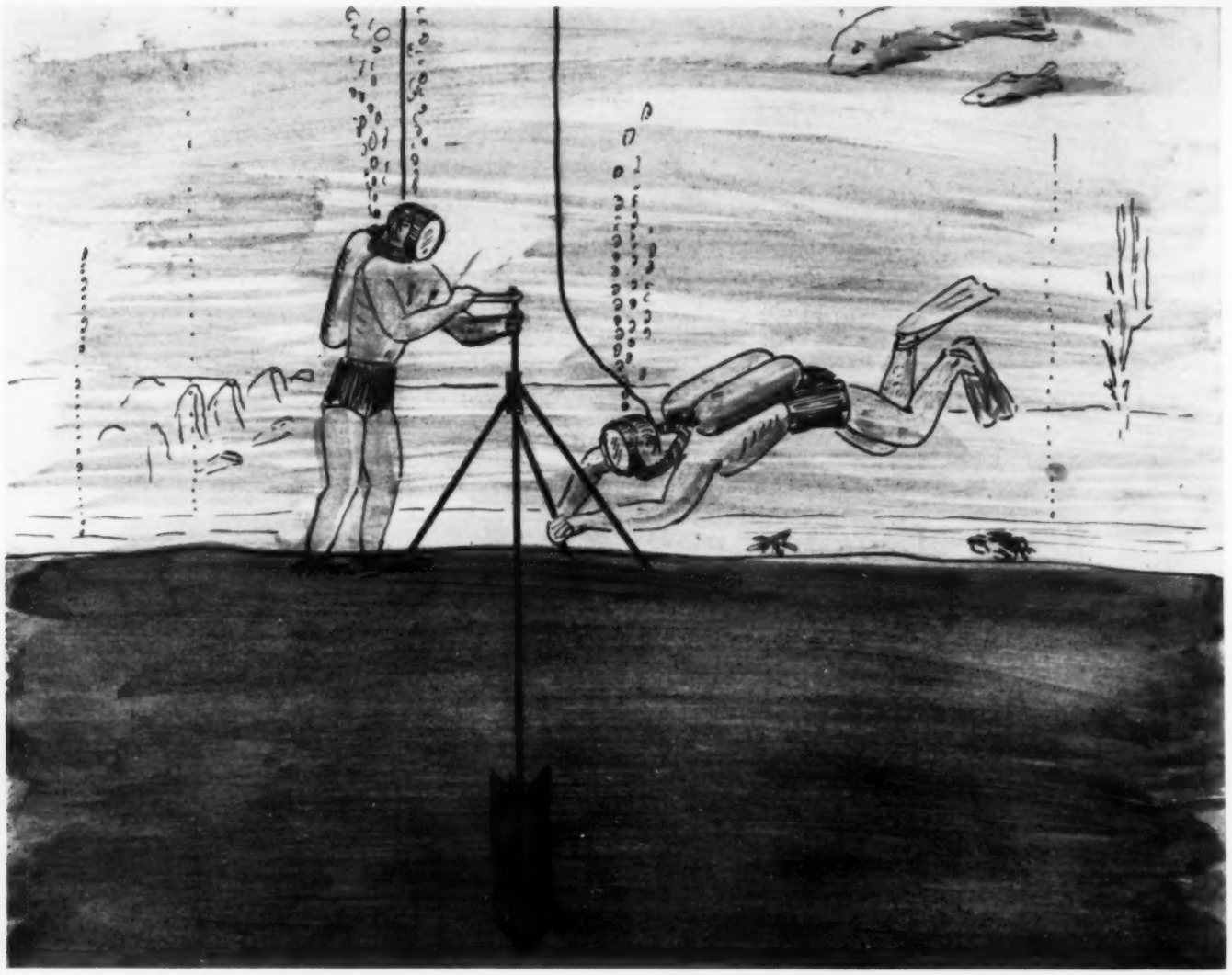


FIGURE 1—Shear strength of bottom sediments in the undisturbed state may be determined by divers using a foundation engineering tool under water. Force required to turn the valve is measured by a torque wrench.

What the Gulf Can Do To a Pipe Line

Bottom conditions, tides, waves, currents, and the marine environment all create special problems for the contractor and operator. Experiences of men familiar with the ocean's behavior can help solve them.

By JOHN C. FREEMAN and CHARLES L. BRETSCHNEIDER
Gulf Consultants, Houston

THERE HAVE been several hundred miles of submarine pipe lines laid but there are still many questions to be answered on each new job. Should the pipe be buried in the bottom sediments? Will it sink so deep that operation will be difficult or dangerous? If long strings of pipe are towed into the Gulf, what are the possibilities of damage by waves? What about wild resonant vibration of the pipe while being handled at the surface? Can the pipe be pulled along the bottom? Will marine organisms attack the coating on the pipe? Will currents, waves, or hurricanes expose or break the pipe? Will the sediments move during storms and what would be the effect on the pipe? And there will be more questions.

Preliminary studies show that burying the pipe line reduces both chemical and biological damage to the

pipe. Ordinarily pipe lines will be buried in marine sediments. The right-of-way of the pipe line should be chosen to allow the pipe to be placed several feet under the ocean floor as inexpensively as possible. Shell reefs and outcroppings of "Beaumont clay" interfere with trenching; these zones should be avoided if possible.

Sometimes the advantages of less biological damage and less intense wave forces on buried pipe may have to be sacrificed because of the expense involved. It may be more expedient to anchor the pipe to the firm ocean floor to prevent wave damage and to increase protection against chemical and biological action. Inspection and repair of pipe by divers during the years of operation of the pipe line may be less expensive than blasting through a reef or a clay bank.

Small areas of soft, non-supporting "goo" may be just as troublesome as reefs. If the pipe line goes through a pocket of sediment with practically no shear strength, then it is in effect suspended over this area like a cable. Pipe may be stretched and damage can result from these quite common situations. A soft pocket only a few hundred feet wide and a few feet deep can still be dangerous. The pipe line designer should answer questions: Is it cheaper

1. To avoid the area?
2. To bury the pipe deeper to find supporting sediments? (If so, how deep are these sediments?)
3. To "float" the pipe at the mud line by making it buoyant?
4. To support the pipe in the soft mud with piles?

These questions cannot be answered without a careful study. This study is best made before the pipe line is started and before construction contracts are let.

For example, the very weak shear strengths of the sediments near the Mississippi Delta vary with depth. Lengths of pipe can be buried 20 feet by their own weight in a few days. The shear strength of the sediment in its natural undisturbed state seems to be measurably greater than that found in cores. An inexpensive method of measuring this shear strength, using divers and light equipment, is illustrated in Figure 1. A survey by divers could determine the depth to bury the pipe so that the shear strength would hold the pipe down even if a change were made from oil to gas transmission. This depth may be so great that the pipe should be placed higher and piles used for stability.

Diver and Acoustical Surveys Pay. An acoustical survey should be made of the proposed route to find the major topography of reefs and clay. A walking survey by divers along the right-of-way can net the same kind of savings that terrain surveys bring about on pipe lines ashore. A diving team can walk a mile of under water right-of-way for less than two hundred dollars. Only a few hundred feet difference in the location of the right-of-way may save hundreds of thousands of dollars in construction costs.

What About Wave Action? In addition to the location of the pipe line, preliminary planning as to the time of year the pipe will be taken out to sea and when to schedule any other work done on the water can save hundreds of thousands of dollars. Commonly, in March and April, and sometimes in February and May, there are long periods of very strong south winds preceding cold fronts. These winds blow all the way across the Gulf and kick up 3 to 8-foot waves for long periods. The days when offshore pipe line work is hazardous or impossible are usually spaced throughout the month in such a way that schedules fall months behind during such periods.

Much wasted effort could be prevented by making a weather and wave survey to determine the probability of say 5, 10, 15, etc., uninterrupted work days during certain months. Such a survey would show that the pipe line could be finished at about the same time and at far less cost if the offshore work were concentrated in months with good working conditions. A crew may be able to do more work in one good month than in five bad months.

Resonant Frequencies in Waves Can Destroy Pipe. Waves in the Gulf will have an average period for any given direction. This period will change from place to place and from time to time. It should be carefully determined beforehand that none of the frequencies of free oscillation of a span of pipe will coincide with the most common wave frequencies. If the frequencies of waves and pipe coincide, resonance may result, and the

About the Authors

JOHN C. FREEMAN has extensive experience in both oceanographic work and weather studies in the Gulf of Mexico. He studied mathematics and physics at Rice Institute and has completed graduate studies in meteorology and applied mathematics at California Institute of Technology, Brown University, and University of Chicago. Dr. Freeman was a weather officer with the U. S. Air Force from 1941 to 1946 and was for several years active in research in meteorology and oceanography at Texas A. & M. College. He has written over 20 papers on research in these two fields, plus several confidential reports for construction and shipbuilding companies. Dr. Freeman is now research meteorologist, oceanographer and weather forecaster for Gulf Consultants in Houston.

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CHARLES L. BRETSCHNEIDER is particularly familiar with the behavior of wind and waves in the Gulf. He has studied at Hillsdale College, Mich., and the University of Michigan, and received a master's degree in civil engineering from the University of California. A weather officer for the Air Force during World War II, Bretschneider has been a professor of mathematics, research engineer, and is now an associate in oceanography and project supervisor at the Texas A. & M. Research Foundation. He has published several articles on waves and their effects on offshore structures.

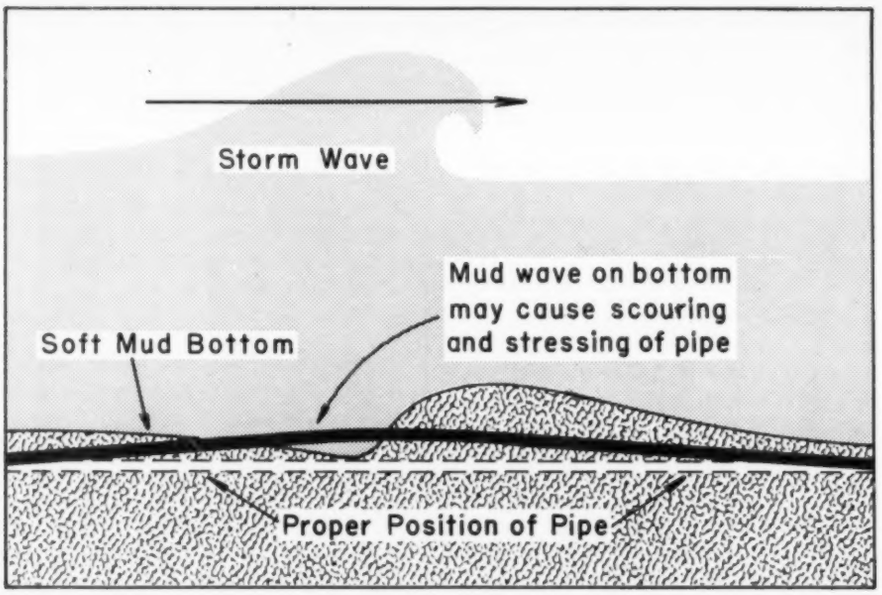


FIGURE 2—Large waves, such as those induced by Gulf storms will cause a wave motion in the liquefied bottom sediment such as that often found in the Mississippi delta area. Forces acting on the "buried" pipe line may be damaging.

pipe may oscillate wildly and damage towing vessels or lay barges. It may break lines that are holding it and be lost, or it may bend beyond the elastic limit and be damaged.

Gulf Tide Tables Can be Misleading. Tides must be considered both in designing the pipe line and in scheduling construction. In many areas such as the Texas and Louisiana coast, where the tide table shows only one or two feet range in the tides, wind and weather cause the most important tidal effects.

During the winter, a strong cold front may cause such a low tide that swamps are mud bogs and bays are not navigable outside of the regular channels. Again, a strong south wind will blow for days and set up such high water in the bays that low-lying docks and work right at the shoreline are flooded out. At these times one spread superintendent might find himself trying to use land equipment in water one day while another might be having to work off barges over land.

Hurricanes cause especially high tides, called storm tides. It was the storm tide that killed 8000 people in Galveston in 1900. The combination of low pressure and strong winds piles the water up to as much as ten feet above the usual water level. This means that structures as much as 15 feet above water can be swept by waves and suffer water damage. Any permanent coastal structure that is not protected by a sea wall should be built to withstand water and wave forces up to 15 feet above the water level.

When a hurricane threatens a coastal operation, management must decide whether (1) to evacuate men only, (2) to move men and equipment, (3) to tie down and leave, (4) to tie down and remain on hand to prevent damage, or (5) to keep working. An intelligent choice must be made which will save lives and save money for the contractor. The contractor should have accurate information about the storm tide that will accompany this hurricane. Plans must be based on force computations for each of the operations contemplated.

Storm tide forecasts require a large amount of preliminary work. The problem is different for each locality. One side of Galveston Bay might have a relatively harmless two-foot tide and the other side of the bay a damaging five-foot tide. A well prepared forecast for the specific area could save the pipe line contractor hundreds of thousands of dollars.

For a permanent platform, such as a pumping station or storage tanks, the design engineer can save money on construction, design up to strength to prevent damage, or design protective dykes, if he has accurate predictions of maximum storm tides. Dollars spent to obtain accurate storm tide information will save hundreds of dollars in construction costs or prevent thousands of dollars in damage.

Waves are the most obvious and dangerous enemy of the submarine pipe line. Waves in the Gulf may get 40 to 50 feet high in hurricanes. And they will exert forces on any surface that is in the water. If a great length of pipe is not buried, the sum of the wave forces all along the pipe can be tremendous. High waves of hurricanes cause significant water velocities on the bottom. The moving water tries to drag the pipe along. If a drag exists along a long span of pipe, and there is no local resistance to this force, the pipe may be stretched or twisted to a dangerous degree. It may be just moved slightly, but even this could cause a collision with some other structure.

Wave Forces Reach the Bottom in Shallow Water. Obviously, because of the danger of forces due to the waves, and for other reasons, also, pipe lines will usually be buried in the sediment. Will the pipe stay buried? And is it completely free of forces due to waves when it is buried? A large breaking wave disturbs the water all the way to the bottom. It stirs up mud and sand for several feet (the depth depending on the structure of the bottom).

Depending on the bottom configuration and the motion of sand around the pipe, a pipe can be exposed by the action of waves or forces can be exerted by sand moving around the pipe. If the pipe is exposed by the action of waves in a hurricane, then unforeseen biological or chemical action might result. Inspection by divers and testing of the pipe line are necessary after a hurricane has gone over the pipe line.

One possible action of the almost liquid bottom sediments that are common near the Mississippi Delta is that they will get stirred up by a hurricane and become a viscous, dense, specific gravity of 1.5 liquid. One surprising result of this "liquefying" of the bottom sediments is the occurrence of waves in this mixture as shown in Figure 2. The forces on the pipe line due to these "heavy" waves would be tremendous.

If a hurricane stirs up the mud and destroys its shear strength, the pipe will sink or rise, depending upon its bouyancy. Resulting tension forces are dangerous.

Consider Currents, Too! The currents due to the day-to-day tides and those resulting from ordinary winter and summer storms can reach two

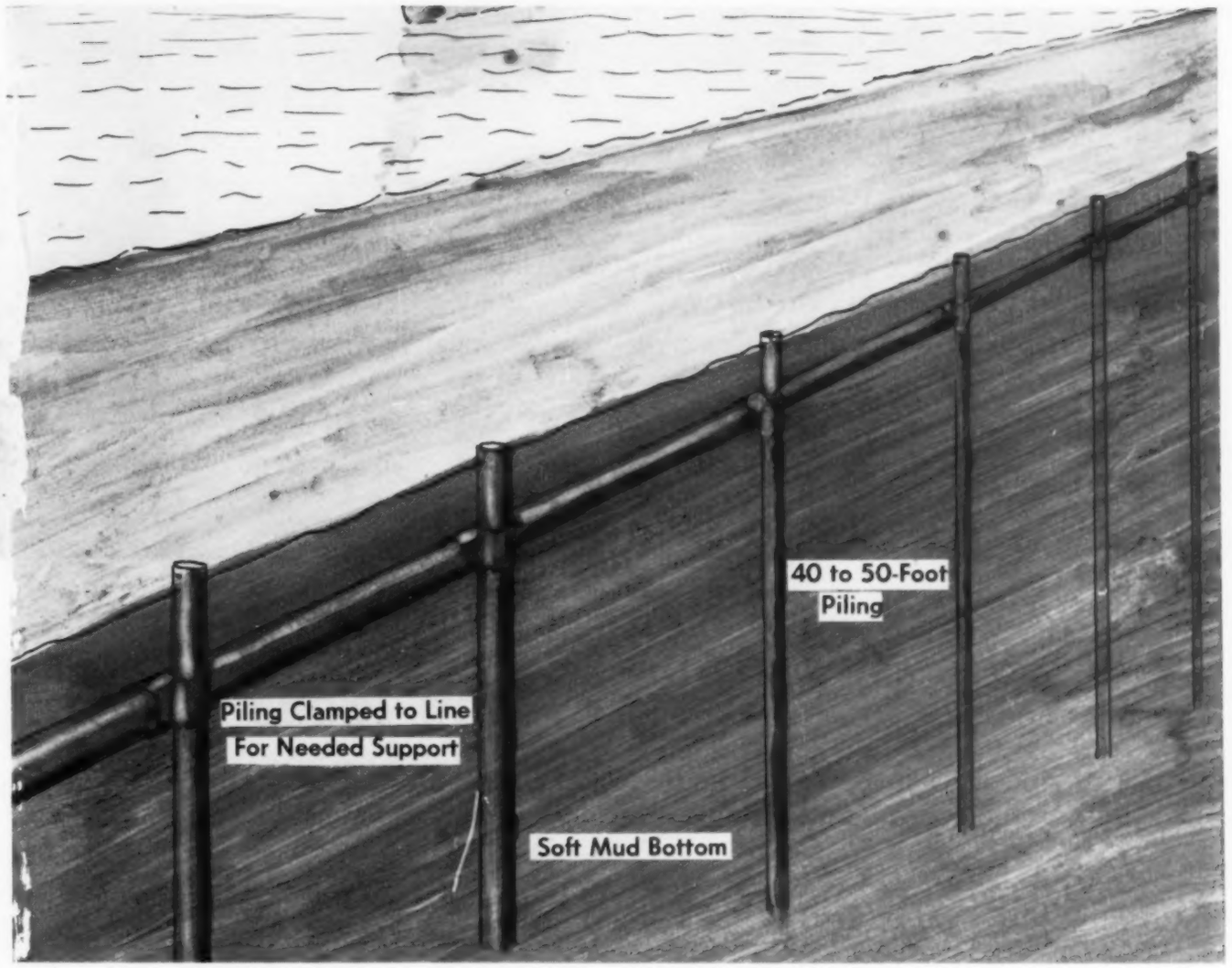


FIGURE 3—Where bottom sediments will not support the weight of the pipe line with stability, piling may be driven deep into the soft bottom for added support.

knots above certain parts of the Continental Shelf. A two-knot current w'll move very small mud particles on ' bottom, and even a ⅔-knot cur- nt will move medium sand. The ssibility that tidal currents or wind currents will expose the pipe st be taken into account. Locations own, found, or computed to have ge currents should be avoided or otected against. Again, this is a roblem that must be studied for the lividual right-of-way of each pipe e.

rrosion and Biological Attack arit Attention. The chemical and ological effects on pipe lines have ceived a great deal of attention elsewhere. To just mention a few quick examples, it is known that certain bacteria attack asphalt and other petroleum derivatives and ultimately destroy them. The teredo attacks cellulose and its derivatives and thrives on them. Concrete with too high a content of tricalcium aluminate breaks up easily in sea water, and yet the proper proportion of aluminum compounds prolongs the life of the concrete.

The vertical structures of the offshore pipe line (gathering platforms, risers, pumping stations, etc.) must be protected from chemical and biological attacks just like any other offshore structure. Wooden structures must be protected against marine life, and all structures must be designed to withstand hurricane wave forces or to cause no major loss to the pipe line should they be destroyed.

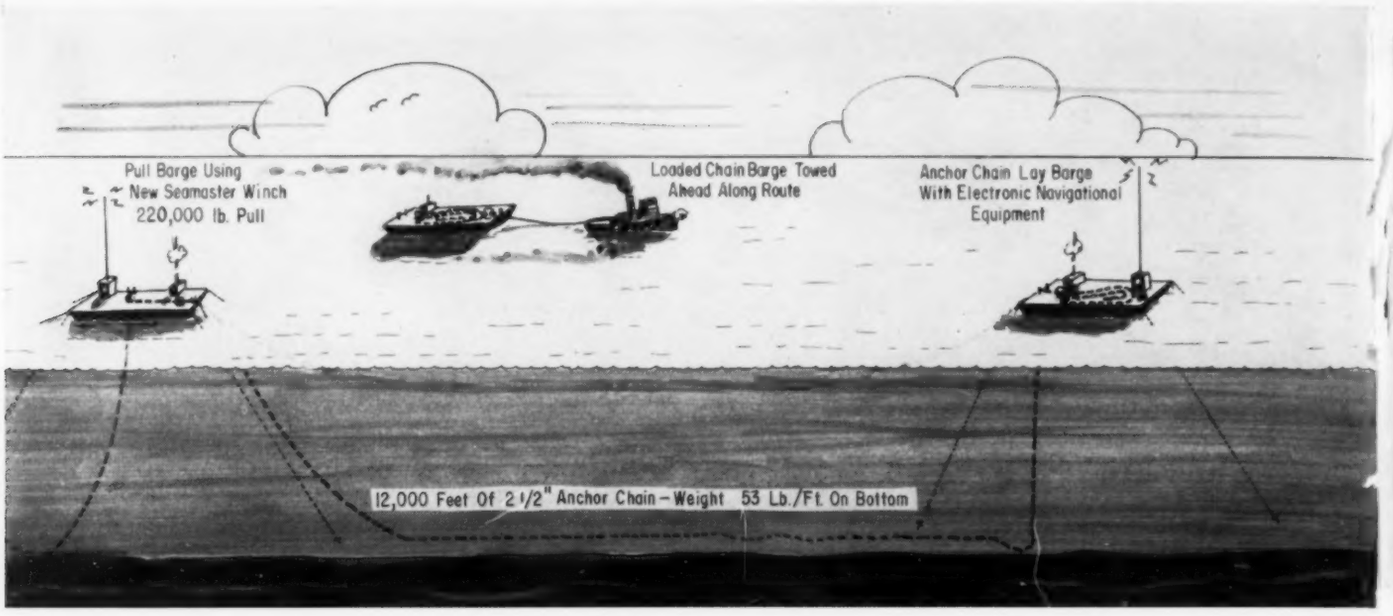
In Gulf Operations, Plan for the Worst. The operator of a marine pipe line must resign himself to the fact that there are going to be times that he cannot reach parts of the line for any reason. There will be other more frequent and longer periods when work cannot be accomplished efficiently. For example, if records are kept on charts at a pumping station, the charts should have plenty of extra space to allow for late arrival of the operator. Telemetering of information about operation of the pipe line should be considered very seriously.

Although the helicopter has provided one answer to the problem of transportation over open water, there is still need for development of a good fast boat for use in offshore work.

Because some of the pipe will likely be exposed on the bottom, and because the ocean sediments are not as stable as ordinary ground ashore, periodic inspection of the pipe line by divers will be necessary. This is especially true after hurricanes when it is likely that buried pipe will be uncovered and possibly the protective covering damaged.

Careful attention to oceanographic factors offshore and their possible effects on the line will pay off.

—**The End**


Pull Barge Using
New Seamaster Winch
220,000 lb. Pull
Loaded Chain Barge Towed
Ahead Along Route
Anchor Chain Lay Barge
With Electronic Navigational
Equipment
12,000 Feet Of 2 1/2" Anchor Chain – Weight 53 Lb./Ft. On Bottom

New "Friction Transportation" method developed by Collins Construction Company for pulling long, deep, submarine pipe lines uses the anchoring drag of 12,000 feet of 2½-inch chain.

New Ideas Promise

Pipe lines to be towed under water by a pull barge working along heavy anchor laid on the ocean floor. Lengths up to 50 miles now planned.

By MELVIN A. JUDAH
Editor, PIPE LINE INDUSTRY

THE NEED for an economical way to move offshore oil and gas to connecting pipe lines and refineries on the Gulf Coast is stepping up the interest in submarine pipe lines. And new construction methods—with the emphasis on speed and economy—are being developed.

The latest engineering designs to attract widespread attention include several being developed by Collins Construction Company. The new "Friction Transposition" method is a modification of the patented "Continuous Marine Traffic" method which Collins used on the Straits of Mackinac crossing where two 4-mile submarine lines were pulled at depths of as much as 260 feet. The "Friction Transposition" method is designed for the longest and deepest pipe lines now anticipated for the Gulf.

What does the new method promise for submarine pipe line construction? Up to six miles of "Big Inch" line may be laid into the Gulf every 24 hours. It may be used in water as deep as 2600 feet; however at these depths pipe must be pressurized. Lengths of pull will be limited only by the tensile strength of the pipe itself. Lines up to 100 miles in length are being considered in the design of equipment.

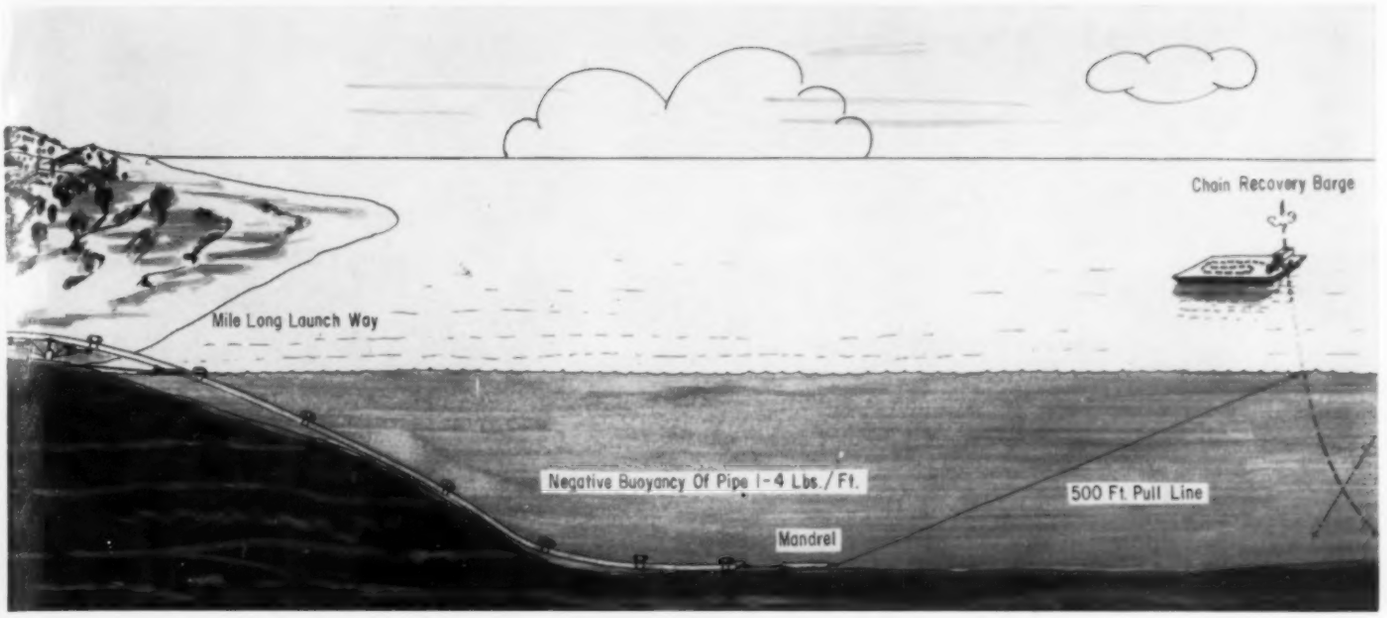
How Will the Method Work? Pipe will be welded onshore into mile-long strings on launchways using equipment already proved successful on many submarine jobs. Rubber-tired launchways, main pipe launching unit, a holdback winch, and the auxiliary equipment will be located at the beach launching point.

Before launching each string, pontoons will be banded to the concrete-coated pipe to give it the proper negative buoyancy for absolute control under existing sea and current conditions. For normal launching operations, a negative buoyancy of about 1 to 4 pounds will be used.

The key to the new method is the pulling barge, equipped with a heavy-duty marine winch to handle approximately 12,000 feet of 2½-inch anchor chain. The giant "Seamaster" winch has a pulling capacity of 220,000 pounds upon a single chain pull. It is driven by a 600-horsepower diesel engine. As chain is pulled across the pull barge deck it will be recovered by a chain storage barge astern. Detachable links permit the chain to be sectionalized, and as the recovery barge becomes loaded, it is towed ahead to the chain lay barge station.

Pipe will be pulled straight down the centerline of the route directly in the path of the chain. The 2½-inch chain to be used for most pipe line pulls weighs 53 pounds per foot in sea water and research conducted by the British Admiralty indicate that it has an effective friction factor of approximately 2½ times its own weight. Holding factors will depend upon the composition of the bottom; however no difficulties are expected in the Gulf. Working load of the chain is 492,000 pounds.

If additional friction should be needed for larger lines a dual chain could be laid out parallel to the first to move the barge along. Using the single 12,000 feet of chain, pulls of 30 to 50 miles are considered feasible.



to pull up to 50 miles of line from a single shore launchway. Pontoons regulate negative buoyancy for accurate control and the best pulling conditions.

Faster Pipe Laying Offshore

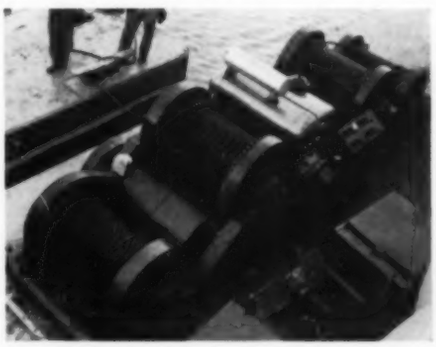
Should the length of a string of pipe on the bottom cause the tensile stress to approach the limit specified by an owner, a pulling collar could be attached at an intermediate point and another anchor chain and pull barge used in a similar manner. Pipe could remain on the bottom at all times, reducing the effect of surface hazards caused by waves and seas.

The "Friction Transposition" method normally would be used for pipe lines to be laid in a comparatively straight line. Proposed offshore lines would not present any difficulty as most will be laid in comparatively straight lines from shore.

Chain Lay Barge to Use Electronic Navigational Aids. Development work is also under way on adapting radio control equipment to the chain lay barge, so it would be accurately directed along the projected centerline by means of electronic aids. This would be especially valuable on long lines when the pull barge will be out of sight of land and visible range markers.

Control Maintained at All Times. Where side currents might exert large forces on the pipe broadside, negative buoyancy could be increased to give better lateral control under optimum pulling conditions. Back tension will be maintained constantly—by a holdback winch during pulling operations and by a holdback clamp and standing holdback while each new string is being welded.

In Good Weather Pipe Strings Can Be Towed at Surface. As sea conditions permit, Collins plans to tow strings of pipe supported by pontoons at the surface. This method could be used where a line might have to make a marked sidebend. Strings could be towed to the seaward end of the line pulled earlier and tie-ins made by barge. If weather or seas foul up on the way, the string may be lowered to the bottom by removing pontoons ever so often along the line to allow it to sink to the bottom.

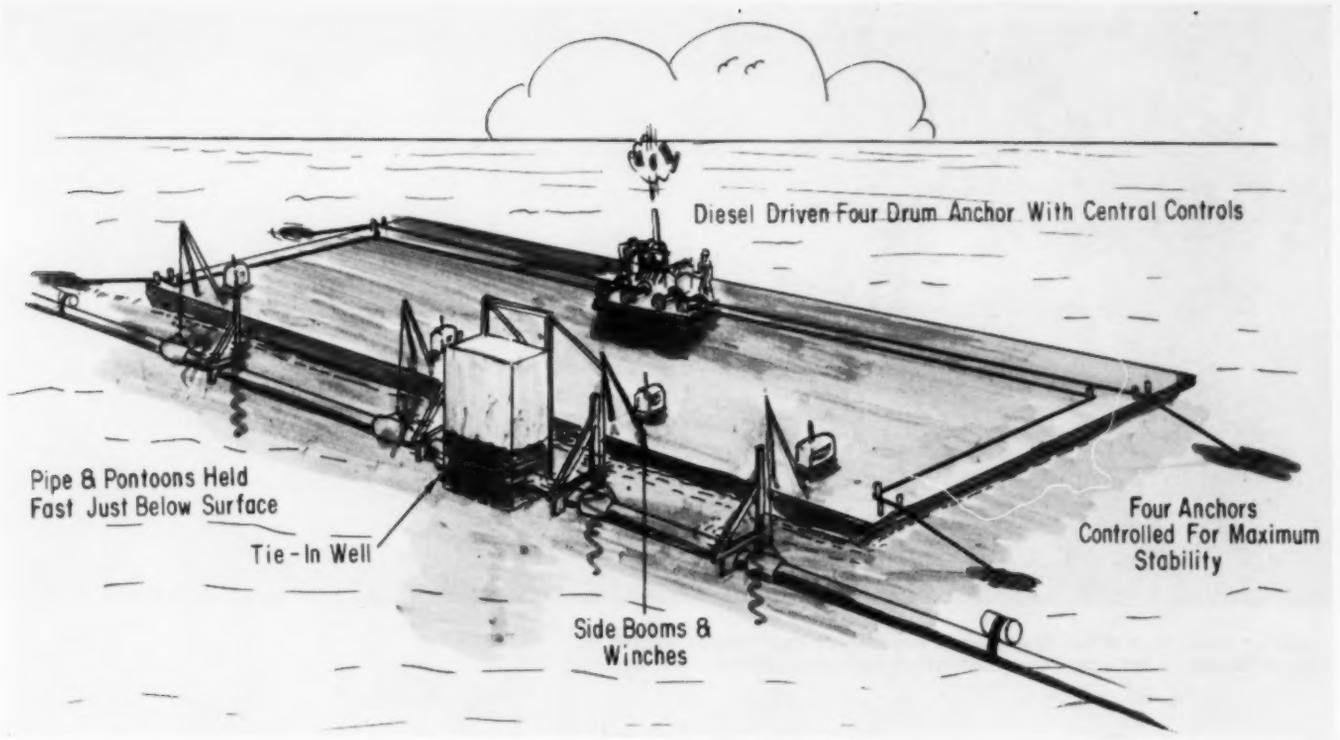


Centralized anchoring control of Collins' new tie-in barge is made possible by this four-drum winch. Power supplied by a diesel torque converter unit may be controlled by one man at this central station. Stability is maintained during tie-ins of two sections of pipe floating just beneath the surface.

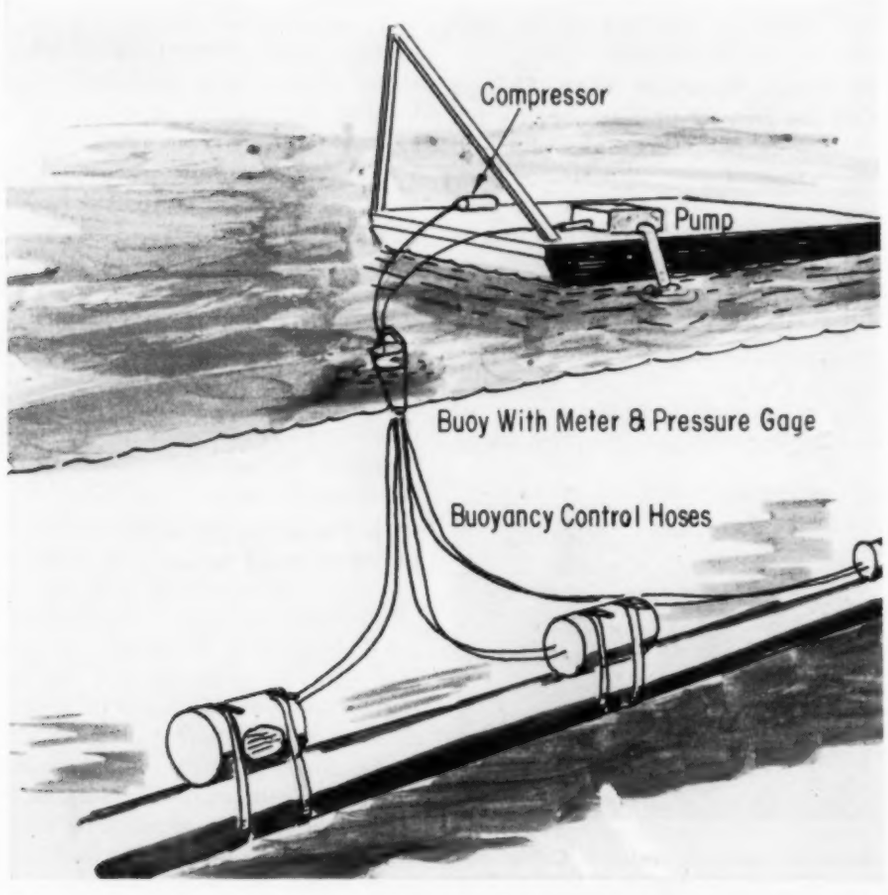
Then when weather again permits normal construction operations the string might either be towed to the location underwater or raised to the surface. To raise a line from the bottom pontoons are flooded and sunk to the bottom and fastened to the pipe at required intervals. After they are banded to the pipe by a diver, a specially equipped barge with an air compressor, pump and meter buoy is attached to one or more of the pontoons by rubber hoses. Water is forced out of the pontoons until the required buoyancy is achieved. Pipe may then be handled at the surface for tie-ins.

New Tie-in Barge with Submersible Well Used for Joining Strings. To make the tie-ins of pipe strings afloat near the surface, Collins engineers designed a barge to hold the two joints of pipe securely in the water. The weld is made in a submersible well mounted alongside the barge. Both strings remain in the water. Four diesel powered "sidebooms" hold them securely for lineup. Buoyancy supplied by the pontoons makes the weight of the pipe in the water negligible.

Both joints are locked in the welding well, the well is pumped out, and


Diesel Driven Four Drum Anchor With Central Controls
Pipe & Pontoons Held Fast Just Below Surface
Tie-In Well
Side Booms & Winches
Four Anchors Controlled For Maximum Stability

Tie-in barge with a submersible welding well alongside completes marine tie-ins with both strings afloat just under the surface. Pipe is supported with four diesel powered booms. A centrally controlled four-drum winch maintains positive control of the barge.

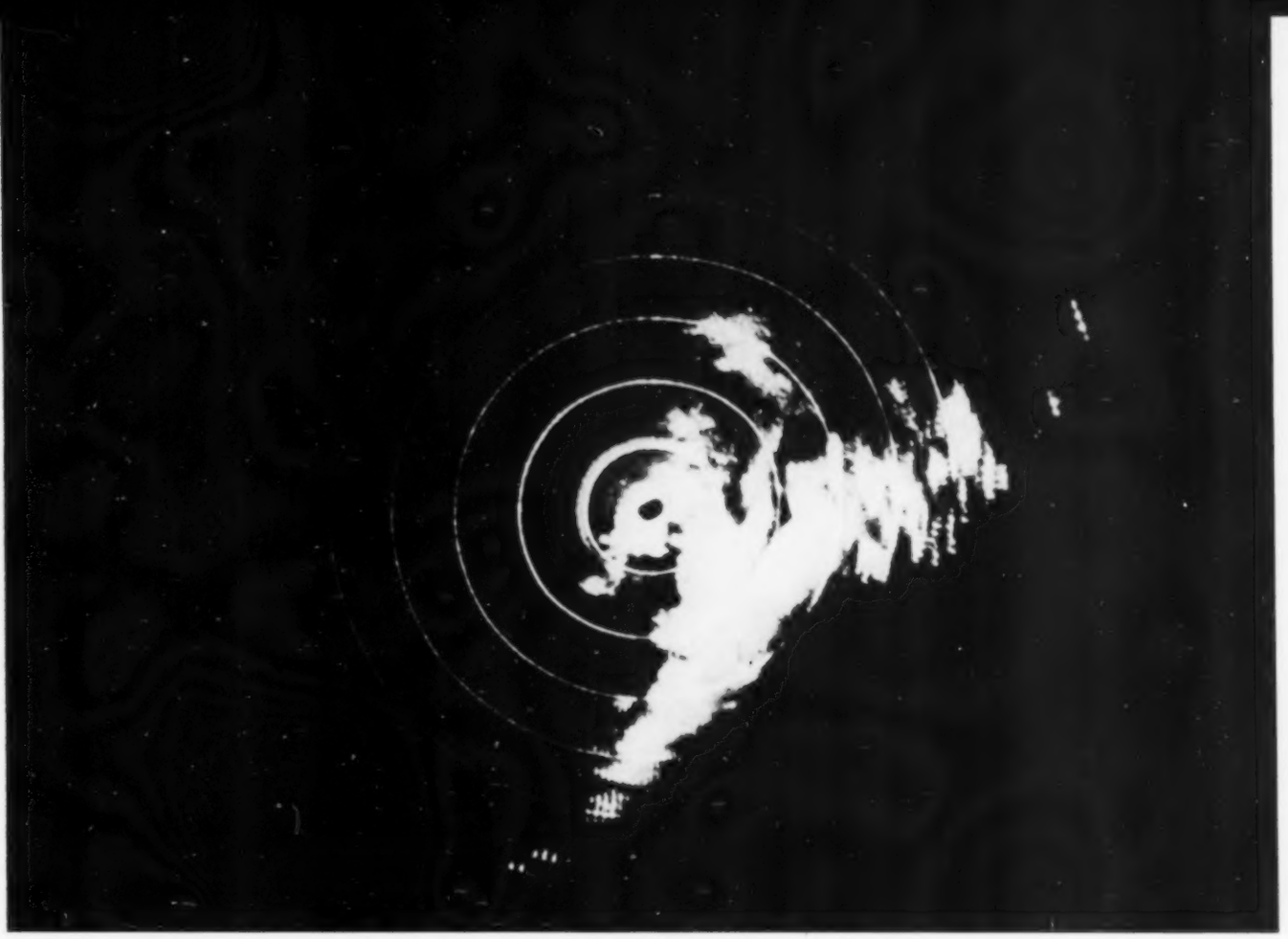


Strings of pipe for new offshore lines may be towed to location on the bottom and then raised for tie-in. To raise the pipe, pontoons will be sunk and banded to it; then compressed air forces water out of pontoons to float pipe to the surface. A barge equipped with compressor, pump, metering buoy, and hoses may serve several pontoons.

welders make the tie-in with a 10- or 12-foot pup joint. Control of the barge is maintained by new type four-drum anchor winch designed by Collins engineers. It is powered by a diesel engine through a torque converter. One man can operate all four barge anchors from a single control station, maintaining maximum stability during tie-ins. Each anchor line drum has a capacity exceeding 50,000 pounds. Winches and fittings are cleated to the deck and can be quickly detached and shifted to another barge.

Hydraulic Banding Tool to Speed Pontoon Work. Attaching pontoons to the lengths of line now planned could be a major job in itself. So Collins engineers are now testing an automatically controlled hydraulic banding tool. It will not only speed up the banding of pontoons, but also will insure even tension on all pontoons throughout the length of the string. A high-tensile banding steel also will be used.

If these methods prove as successful in submarine pipe line construction as early tests indicate, it may be possible to lay pipe under the ocean in any weather that barges and men can ride out on the surface. The result could change the laying offshore lines from a custom type job to one of standard practices. —**The End**



Squalls and rapidly-occurring local storms cost a lot in lost time in offshore pipe line construction. This is how one appears on a weather observer's radarscope. Radar coverage is a useful tool in detecting and tracking storms in the Gulf of Mexico.

Work With the Weather—It's Cheaper

Use weather data in long-range planning, weekly forecasts to schedule operations, and day-to-day forecasts as work progresses. Records of Gulf weather plus hundreds of current reports can make offshore work easier . . . and safer, too.

By DeWITT R. GAYLE, JR.
A. H. Glenn & Associates, Houston

LOST WORKING time resulting from rough seas has been the big cause of incorrect cost estimates in offshore pipe line work. However, there are fairly well established seasonal weather patterns in the Gulf and the proper analysis of records and reports can give accurate estimates of lost time. Weather and oceanographic information should be evaluated for the specific location, season, and conditions to be most useful. All of these factors will vary from day to day and a forecast at one time or place can be of little value a few miles away or a few hours later.

For long-range planning, records of wind and wave forces and their direction will give the contractor an idea of just what percentage of the time he may be able to work at a particular Gulf location at various times of the year. Wave forces have been the critical weather factor in Gulf pipe line operations. Their effect on pipe being laid off a barge governs when work can progress.

Typical wave height data is shown in Table 1 and presented graphically in Figure 1. These "wave roses" compare conditions observed in the Gulf at an exposed location in winter and a sheltered area during "calm" summer months. They are based on a careful review of weather maps and wave reports from many operating rigs, geophysical boats, and ship reports since offshore work began in 1948. Records now cover a sufficiently long period to assure a representative sampling so that they may be applied for an estimation of lost time for proposed work.

Sea heights and directions permit evaluation of the type job that might be carried out and the equipment to be used. For example, a contractor knows from experience that he can lay so much line per day in seas of two feet or less. In seas of 2 to 4 feet some lesser amount can be han-

dled, and it may be necessary to shut down completely above 6 feet. Using these percentages of the various height groups, he can predict the time required for a job under the specific conditions. The estimate can be refined further by considering the direction of the seas in these various height groups.

How to Use Weather Data. Referring to Table 1, for a typical exposed deep water location during a winter month, excellent working conditions would exist only 3.7 percent of the time. Fair to good conditions could be expected 34.4 percent of the month; these wave heights allowing all but the more critical operations to be carried out. During 33.5 percent of the month the situation is marginal, depending upon the nature of the work and equipment used. Summing up the other categories, 28.4 percent lost time could be expected, and it would be likely that equipment would have to be brought in to sheltered locations several times.

Comparing this with data for a location in medium depth and protected from the north and east, definite lost time of only 3.3 percent would be anticipated during a summer month. Almost 50 percent of this summer month would be suitable for all types of work.

These are two extremes. However, they illustrate how weather information can be used profitably. An evaluation for any location, water depth, exposure, month and area will give an accurate estimate for any specific job. Such studies of wind and wave information are now being used successfully by a number of operators in the Gulf. Contractors use the data for estimating work time on turn-key jobs. Operators use it to decide whether to use day-rates or turn-key jobs, what method and equipment to use, and the construction time anticipated. With this complete monthly data for a specific area, both can select the best time of the year to work offshore to minimize lost time and get the work done at the least cost.

Weather Forecasts Can Help Pick a Good Day to Begin Work. Once a particular time has been selected for work in the Gulf, a second type of weather report called an "extended outlook" will give a prediction of the type weather to expect for the first week or so.

When a given circulation pattern and its corresponding storm track is established in the Gulf, these usually will persist for a week to perhaps several weeks. For example, during winter months when the storm track is shifted to the south with storms reaching maximum intensity through the central U. S., poor working conditions may last for several weeks. There would be strong northers preceded by rough southerly seas and the periods of good working conditions would be very brief.

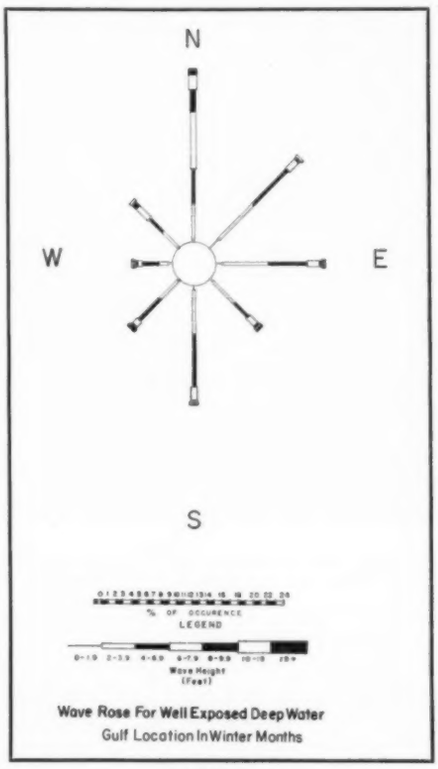
As the storm tracks shift north or when storms reach maximum intensity off the West Coast, extended periods of fair to good conditions can be expected with relatively weak northers preceded by little or no southerly increase in seas. Typical wave heights for these two conditions are given in Table 2.

This extended outlook will be use-

TABLE 1-A
Winter Month Percentage Distribution of Wave Height Groups For Well-Exposed Deep-Water Location

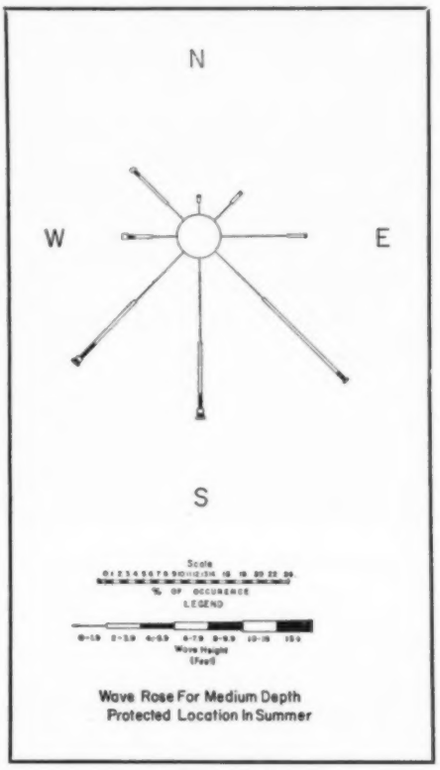
	0–1.9	2–3.9	4–5.9	6–7.9	8–9.9	10–15	15+	Total
N	0.2	4.8	4.5	7.4	2.9	2.0	0.7	22.5
NE	1.4	6.4	6.3	1.8	0.4	0.2	*	16.5
E	0.6	5.9	5.1	1.8	0.4	0.3	0.1	14.2
SE	0.4	4.0	2.4	1.4	0.2	0.2	0.1	8.7
S	0.4	5.8	6.8	1.8	0.3	0.3	0.1	15.5
SW	0.2	3.5	3.9	0.9	0.2	0.2	0.1	9.0
W	0.4	1.2	2.2	0.6	0.4	0.2	0.1	5.1
NW	0.1	2.8	2.3	2.1	0.8	0.4	*	8.5
Total	3.7	34.4	33.5	17.8	5.6	3.8	1.2	100.0

* Less than 0.1 percent occurrence.



Wave Rose For Well Exposed Deep Water Gulf Location In Winter Months

FIGURE 1-A



Wave Rose For Medium Depth Protected Location In Summer

FIGURE 1-B

TABLE 1-B
Typical Summer Month Percentage Distribution of Wave Height Groups For a Medium Depth Location With Protection From North and East

	0–1.9	2–3.9	4–5.9	6–7.9	8–9.9	10–15	15+	Total
N	1.4	0.9	0.2	0.0	0.0	0.0	0.0	2.5
NE	3.2	1.5	0.3	0.0	0.0	0.0	0.0	5.0
E	8.5	2.4	0.3	0.0	0.0	0.0	0.0	11.2
SE	8.5	13.6	1.5	0.2	0.0	0.0	0.0	23.8
S	10.9	6.8	1.9	0.8	0.3	0.2	*	20.9
SW	9.0	7.8	2.7	0.5	0.2	0.1	0.1	20.4
W	3.1	2.5	0.8	0.4	0.1	*	0.0	6.9
NW	2.8	5.3	0.8	0.4	0.0	0.0	0.0	9.3
Total	47.4	40.8	8.5	2.3	0.6	0.3	0.1	100.0

* Denotes less than 0.1 percent occurrence.

†METEOROLOGICAL-OCEANOGRAPHIC DATA ISSUED 6 AM CST, November 22 1955

THE GENERAL WEATHER SITUATION AT 6 AM CST, November 22 1955

A 30.20 inch high pressure area centered east of Florida extends west-southwest over the Gulf.
A gradually intensifying 29.41 inch low pressure area is moving east over Kansas. A norther is moving southeast 20 mph over Nebraska and Colorado. The following weather and sea conditions are expected. . . . . .
Tuesday—Gradually increasing southerly wind, waves, and swells. Partly cloudy to cloudy skies. Few showers. Tides above normal. Deteriorating working conditions.
Wednesday—Norther expected to reach Texas Coast with shift to northerly wind and waves. Cloudy skies. Scattered showers and thunderstorms. Tides falling below normal. Poor working conditions.
Thursday—Gradually decreasing north to northeast wind and waves. Clearing skies. Tides below normal. Improving working conditions.

THE FORECAST FROM 6 AM CST, November 22 TO 6 AM CST, November 23

WAVES: Location X-3/4 south increasing 8/10 south by 6 AM Wednesday
Location Y-2/3 south increasing 5/7 south by 6 AM Wednesday
WIND: Location X-south 10/15 increasing south 20/25 by 6 AM Wednesday
Location Y-south 10/15 increasing south 20/25 today decreasing south 15/20 by 6 AM Wednesday.
WEATHER: Partly cloudy to cloudy, few showers.
FORECAST RELIABILITY: Average

THE OUTLOOK FROM 6 AM CST, November 23 TO 6 AM CST, November 24

WAVES: Location X-8/10 south shifting 8/10 north Wednesday
Location Y-5/7 south decreasing 4/6 north-northeast Wednesday
WIND: Location X-south 20/25 increasing north 25/35 early Wednesday decreasing north-northeast 20/25 late Wednesday.
Location Y-south 15/20 increasing north 25/35 early Wednesday decreasing north-northeast 15/20 Wednesday night.
WEATHER: Cloudy, scattered showers and thunderstorms
OUTLOOK RELIABILITY:* Average

TEMPERATURE DATA:
FORECASTED MAXIMUM TEMPERATURE AT Houston November 22 78 TO 82 °F
FORECASTED MINIMUM TEMPERATURE AT Houston November 23 69 TO 73 °F

* AVERAGE Reliability defined as expected accuracy within 1.5 ft. of observed waves and no significant error in wind or weather. BELOW AVERAGE Reliability defined as possibility of error in waves in excess of 1.5 ft. and/or significant error in wind and weather forecast. Comparison of observations and forecasts over 1948-1954 period shows 85 to 95 percent of forecasts fall into the AVERAGE Reliability category.
Note: Wind velocities are in miles per hour. Wave heights are given in feet, the first figure being average of the highest one-third of the waves and the figure following the slant being the maximum wave.

FIGURE 2—A typical short-range weather forecast for the Gulf of Mexico.

ful for scheduling work on short jobs or work of a critical nature to take advantage of the best conditions. Careful coordination between the weather observer and the offshore contractor or operator is needed to select the best time for movement of equipment and scheduling work when several good working days are likely.

Short-Range Forecasts Guide Day to Day Operations. The most widely used weather service in the Gulf of Mexico is the short-range forecast. It gives a detailed 72-hour prediction of wind and waves for a specific location. Included is a forecast of wave heights in feet, the wind velocity and direction, an estimate of working conditions to be expected, and an indication of other weather variables such as precipitation, squall activity and fog. Reports are supplied by consulting weather services once or twice daily and supplemented as needed in rapidly changing conditions. A typical report is shown in Figure 2.

Short-range forecasts help to maintain maximum operating efficiency and provide safety for men and equipment. They first come into use when the decision is made on starting operations. Although tying up equipment in port is expensive it is still cheaper than being on location with full crews who are not able to work. To move to location in the face of bad weather conditions can easily lead to several days of lost time at the outset of a project. Good weather may be anticipated for most critical phases of the job, such as connecting onto the platform or working near the beach in the surf by the short-range forecast.

When Should Equipment Be Moved to Protected Water? The expected severity of a storm will govern whether a contractor needs only to shut down a job, or whether equipment should be moved into sheltered water. During tropical storms, strong southerly blows and strong northers, equipment left in exposed water can be damaged so that it is desirable to move it inshore ahead of the onset of rough weather. To move off location, into protected water, and back to the job is costly and results in more lost time than riding it out on location, if possible. An accurate wave forecast will help the contractor to make a decision to minimize lost time, safely.

Where work may not run continuously, 24 hours a day, it may be desirable to coordinate time-off with poor weather conditions. Or it may be possible to schedule the hours of the work day to take advantage of the best conditions ahead of time. During the spring months in the Gulf, winds and seas often increase during the late afternoon and evening with the best conditions occurring early in the day. By re-scheduling work it may be possible to take advantage of this good weather.

When crews "break" one or two days a week, break periods may be arranged to meet predicted weather conditions. For example, the regular day to break might fall on Friday, but the forecast calls for squalls on Friday. The crew could be released Thursday to return a day early and

About the Author

DeWITT R. GAYLE, JR., is a partner in the firm of A. H. Glenn & Associates in charge of meteorological and oceanographic consulting work in the Houston area. He is a graduate in engineering from Rice Institute and did graduate work in meteorology at California Institute of Technology and oceanography at Scripps Institute. Gayle served as a forecaster, weather reconnaissance pilot and weather instructor in the Air Force during World War II and the Korean conflict. He is a registered engineer in Texas.

take the most advantage of workable weather. Adjusting the work schedule to meet changing weather is another way of cutting down on lost time.

Meteorologist Must Work Closely with Operations. Maximum effectiveness of the meteorological-oceanographic information can best be attained by close and direct contact between the meteorologist and the operations superintendent in direct charge of the work. Forecasts are based upon data from four continuous high-speed teletypes plus a facsimile circuit which reproduces weather maps, all running 24 hours a day. Hourly land station reports are received from the entire U. S., Mexico, and the Caribbean. Ship reports, rig reports, and upper air data up to 50,000-foot altitudes add to the stack of weather data that must be evaluated. This is the material that the weather man studies and interprets for a specific location and purpose. It is then put in a concise, written report for routine operations or may be discussed directly for critical conditions. It is best to get the report first hand, and where necessary discuss the expected conditions directly with the meteorologist who interpreted the data.

Weather forecasting is not an exact science. It is not a "black-and-white" solution to every given problem. But it is an approach to minimize the inherent effects and hazards. As a science, it is quite young, but there are many improvements in techniques and instruments now being developed. A $5 million budget was approved recently for research on analyzing and forecasting tropical storms and hurricanes. More adequate radar coverage is being developed, along with increased ship reports and automatic transmitting weather buoys to provide better observations from Gulf areas. In the past eight years, experience has been gained in offshore operations, which will be invaluable in making better evaluation and forecasts of oceanographic and weather effects on Gulf pipe line operations.

—**The End**

TABLE 2
Typical Distribution of Wave Heights Likely To Be Encountered In Gulf For Good Working Conditions and Bad

Wave Height	0–1.9	2–3.9	4–5.9	6–7.9	8+
Normally good summer working conditions (percent)	4.6	43.1	40.5	8.7	3.1
Poor working conditions likely to be met in winter (percent)	2.8	26.4	31.0	26.1	13.7

New Gulf Weather Aid

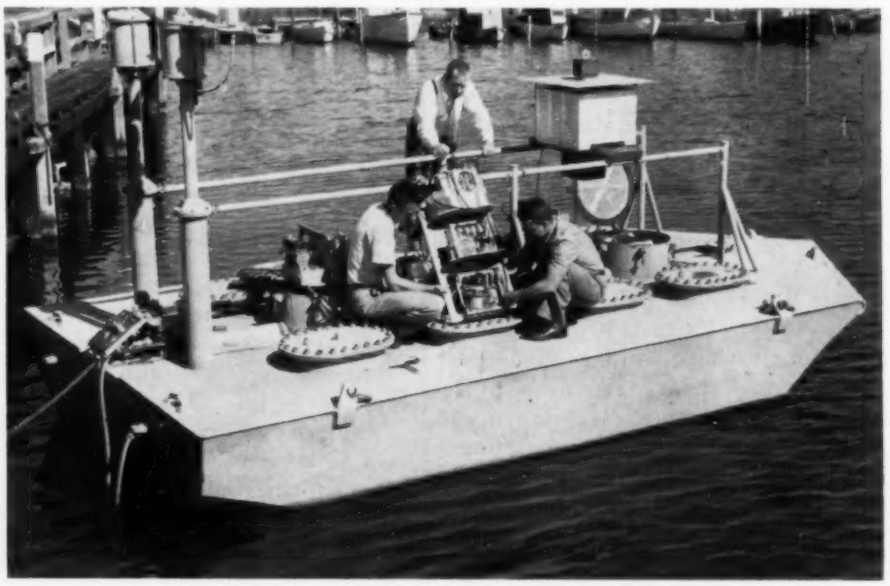
THE NATIONAL BUREAU of Standards has developed a marine weather station that automatically reports local weather data by radio. The unit fits in a buoy that can be anchored in remote locations and left unattended for periods up to six months. At regular intervals throughout the day, the station broadcasts in code the air temperature, water temperature, barometric pressure and wind speed and direction. Radio range is in excess of 800 miles.

Present gathering of comprehensive weather data from many ocean areas outside of regular shipping lanes is limited. A network of these stations, moored in certain areas of the Gulf, could supplement ship and rig reports now received to help give warning of storms as they begin to form.

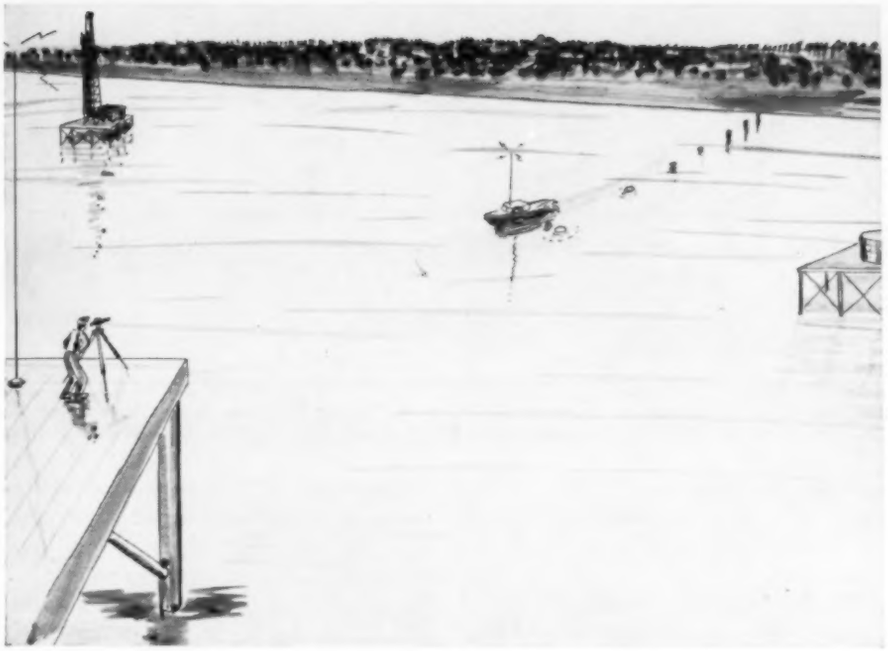
The automatic station translates information from each of five weather sensing elements into three letter groups in continental code and transmits the coded signals on a pulse-modulated carrier frequency at about six megacycles. A single transmission takes three minutes. During this interval, six items of information are broadcast. The first transmission is a three-letter signal identifying the station. Coded transmissions follow containing information on:

- Air temperature between —25° and 110° F.
- Water temperature between 15° and 90° F.
- Barometric pressure between 950 and 1059 millibars.
- Wind speeds from 0 to 68 knots.
- Wind direction oriented from magnetic north.

The buoy which carries the weather-sensing and radio transmitting equipment is 20 feet long and 10 feet wide. Made of aluminum and other non-magnetic alloys to avoid undesirable effects on its compass, the weather buoy can be anchored in waters as deep as 3600 feet, so it could be used almost anywhere in the Gulf. Two masts and four watertight wells extending below the boat deck hold all the electronic and meteorological equipment assembled in compact, shock-mounted units. Each unit may be replaced independently of the others.



This unattended marine weather station radios weather reports.



Surveyors for the Eugene Island line used existing platforms for transit stations. Pilings were driven to mark the route through the East Cote Blanche Bay to Point Au Fer reef. The remaining 13 miles to Platform 51 was marked by lightweight buoys. Buoy laying boat kept station by radio directions from a surveyor on the platform.

Planning the Offshore Line

Economics is the governing factor; from Magnolia's Block 126, the cost of barging 20,000 barrels per day is about five times the cost of transportation by a 48-mile-long pipe line. Here are the methods used in surveying and selecting the route.

By CLYDE ALDRIDGE
Magnolia Pipe Line Company, Dallas

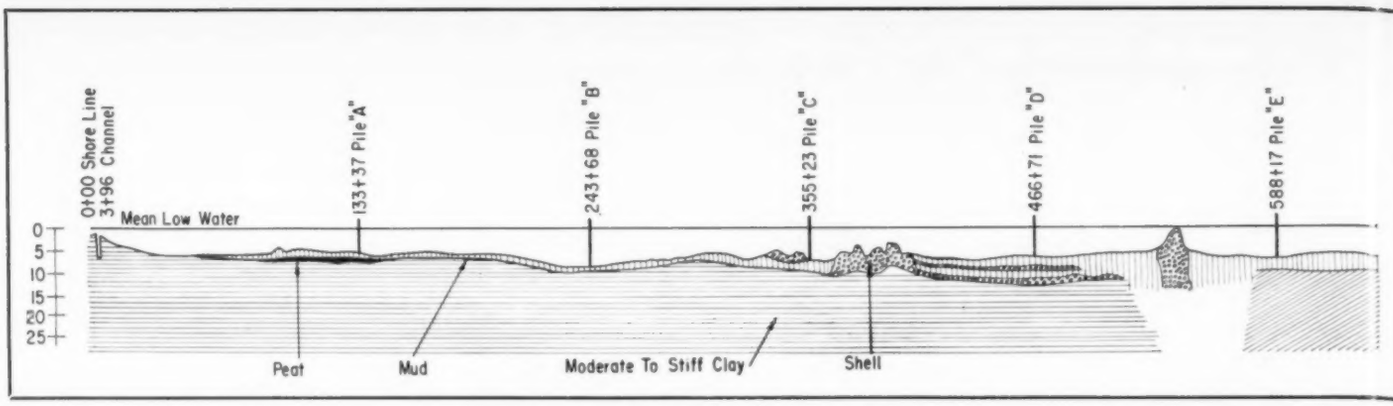
As in every engineering project the planning of an offshore line begins long before the design engineers and survey crews begin the job. Economics of transporting the oil and gas produced controls the decision whether or not to lay the underwater line to the offshore producing area. Weather and other operating obstacles magnify every choice from initial planning to completion of construction.

Magnolia began exploration work in the Eugene Island area off the coast of Louisiana in 1944. First production in this area was in 1950. A tank battery-platform was built and the first oil was barged ashore, but as production increased, small tankers were placed in service. Both means proved undesirable because of their inability to load oil from the platforms in bad weather. Between 1952 and 1954, numerous studies were made to determine the feasibility of offshore production gathering facilities with a pipe line to shore. The feasibility of such a system confirmed, Magnolia started planning the pipe lines in 1954. Weather was a major factor from the beginning. Due to bad weather, movement of oil by barge from offshore will not always be on schedule. If a large amount of offshore storage isn't provided, production will have to be shut in. The resulting loss of production, work over caused by shutting in the wells and damage to the reservoir are factors in favor of a pipe line rather than barge or tanker movement.

Barging may be economical for limited production, but as it increases pipe lines prove to be a good investment. For example, at Magnolia's location in Block 126 at 20,000 barrels per day, the cost of barging is about five times that of pipe line transportation for a 48-mile line. This cost varies with distance to shore, depth of water, and production dispersal, but generally the economics of pipelining becomes even more feasible as these factors increase. This is true in spite of the fact that the cost of laying offshore lines now runs about 2½ times that of a cross-country pipe line of a comparable size and length.

These reasons led to the construction of Magnolia's 48-mile long 12¾-inch line in the Eugene Island area off the Louisiana coast. Initially, the line was designed to transport 12,000 barrels of oil per day, and 10,500 Mcf of gas while operating under two-phase flow at 1000 pounds per square inch. When it becomes overloaded, plans call for converting it to oil flow exclusively, with gas to be carried through another line.

Land Survey Methods Adapted for "Sea Duty." The first step in the survey of the line was to scout the area by boat, plotting structures, visible reefs, channels and other visible obstructions on a U. S. Hydrographic Chart enlarged to a scale of 1 inch to 4000 feet. Aerial photos were obtained of the coastal area. From this plot, a route was selected through the East Cote Blanche Bay to clear all existing production facilities. A field crew staked out the line from the Burns plant to shore line. The rest of the route from Point Au Fer reef south to Block 51 was set as a straight line. Except for one necessary angle to con-



Bottom profile of the route of Magnolia's pipe line to Platform 51 in the Eugene Island area off Louisiana shows the need for a complete survey before construction begins on an offshore pipe line.

form to shore line near Burns, the pipe line's route consisted of two straight lines, doglegging at Block 51. All block lines in the area were plotted on this chart.

Transferring this proposed line to an actual location presented a number of problems. The first step—to transfer all accumulated data from the hydrographic chart onto a map based on the Lambert conformal conic projection. Lambert coordinates were calculated for points along the line at 2-mile intervals. Bearings were taken to known points. Locations of Magnolia platforms were already on this projection. It was necessary to transfer the locations of other platforms to it. This was done by triangulation from shore stations of the U. S. Coast and Geodetic Survey.

Lambert coordinates for all platforms in the vicinity were determined, as well as bearings and distances for the proposed line. Then survey crews were ready to "stake" the pipe line route.

Platforms Used As Transit Stations. In the East Cote Blanche Bay area, it was necessary to build only one 15-foot wooden transit tower. Existing platforms were sufficiently close to our line to serve as transit stations. Using these transit stations, points were located at 2-mile intervals through the bay area and 40-foot wooden pilings were driven to mark the line location. Intermediate locations were made by eye. This procedure was followed on the first 12-miles of line until Point Au Fer was crossed; the remaining 13 miles to Platform 51 was marked by light weight buoys.

The buoy laying boat was kept on line by two-way radio communications; directions came from a transit man on Platform 51. Buoys were laid (approximately every 2000 feet) to establish a visible line. The 22-mile section from Block 51 to Block 126 was marked off in the same way.

Exact stationing of each 40-foot pile was known by triangulation. Buoy locations were approximated by sextant, which was adequate for the preliminary survey in the open waters of the Gulf.

Fathometer and Core Surveys Show Depth and Bottom Conditions. The bottom structure was determined by fathometer surveys correlated with extensive core data. A minimum of two runs in opposite directions along the pipe line route, using portable fathometer at a constant boat speed produced a profile of the ocean bottom (see drawing). Water depths varied up to 8-feet in the bay and 8-feet to 36-feet in the Gulf. Cores were taken at regular intervals with a Hanna core barrel.

Engineers and geologists interpreted the fathometer charts and cores marked a number of locations where additional cores and soil samples were to be taken. Core lengths varied from 1 foot to 9 feet, short cores were taken in very stiff clays with a low water content of less than 35 percent. In sediment with a water content of 40 to 50 percent, longer cores were taken.

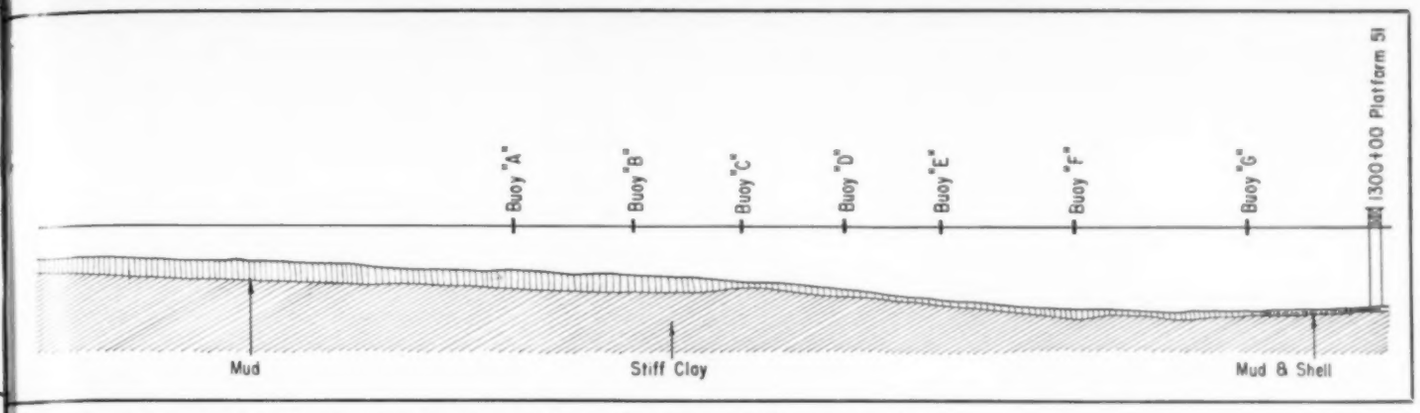
Only three reefs were encountered along the route; Point Au Fer reef was the only cemented shell reef. Analysis of data showed that the floor of the Bay and Gulf along the pipe line route was not covered with a deep soft silt deposit and that the soil at five-foot depth would support the pipe with a minimum of bridging.

Following this procedure along the entire line gave sufficient data to draw an accurate profile of the bottom and its structure to a depth of five feet. Surveys with a low frequency fathometer (Magnolia Sub Strata Acoustic Probe) gave additional data between depths of 5 feet to 35 feet below the ocean floor.

Lines Buried For Protection From Marine Growth. Government regulations require that all offshore pipe lines be buried until a water depth of 15 feet below mean low Gulf level is reached. Rock samples taken from a Block 126 outcrop showed evidence of attack by clams (Lithophaga Bisculcata). The clams do not live below the silt line. To prevent the possibil-

About the Author

CLYDE ALDRIDGE, a 1949 graduate of the University of Oklahoma, did graduate work in structural engineering before he joined Magnolia Petroleum Company in 1950. He worked on various projects for the company's Natural Gas, Producing, and Pipe Line departments. In 1954 Aldridge transferred to Magnolia Pipe Line Company as senior civil engineer. He was in charge of civil engineering on Magnolia's Corsicana-to-Beaumont 20-inch crude line, 12-inch offshore pipe line, and West Texas 12-inch, 14-inch, 16-inch crude system expansion program during 1954 and 1955.



Composition of the bottom, location of reefs, and depth information all influence the selection of the best route for the line.

ity of their boring into the concrete coating, the line was designed for a minimum of three feet of cover. This cover will also give some protection to the pipe line against blast damage by exploration crews.

Accurate Location Held During Construction. To maintain alignment during actual laying of the line, 2 by 2-inch stakes were driven at 200 foot intervals along the route in the bay area. These stakes offset the ditch line by 20 feet. Buoys were used at 2000-feet intervals along the center line of the ditch for the rest of the route. A continuous measurement was made on the pipe as the line was laid. A float with distance markings on it was attached every 1000 feet. Divers inspected the line in the ditch and with soundings taken to the top of the pipe a continuous profile was kept of the completed line. High points were marked on the profile for lowering.

Two 2½ cubic-yard draglines on spud barges dug the ditch in the bay area. Here 36,000 feet of the pipe line was laid at least 11 feet below mean low Gulf level to provide for the possibility of channels being cut in to future well locations. The rest of the ditch was dug to provide a 3-foot cover. To make a clean cut, the ditch was made 20 feet wide at the top and 10 feet at the bottom. The ditch held well and it was only necessary to spend one day with a jet dredge to lower the few high spots located upon inspection of this section.

The Corps of Engineers permit requires that backfilling be done when the profile of the ocean floor is materially changed. On the section of line lowered by jet suction dredge, no spoil was built up and no backfilling was attempted. In this area the natural deposit of sediment from the Atchafalaya River is expected to backfill the line in the next few years.

Pipe used for the line was X-42, 12¾ inch outside diameter, ⅜ inch. It was hydrostatically tested at a pressure of 2100 pounds per square inch. Three joints were tested to an ultimate strength of 3350 psi. The pipe was coated with coal tar enamel, glass fiber wrapper, and pipe line felt covering. Wire reinforced, concrete coating was applied to a thickness of 1½ inches bringing the total weight of pipe to 118 pounds per foot. Brown and Root, Inc., prime contractor on the job, used two conventional lay barges to lay the submarine line, a shallow water barge in the bay and a deep water barge in the open waters of the gulf.

The pipe line is now being operated by Magnolia Petroleum Company for Magnolia, Continental Oil Company, and Newmont Oil Company. —**The End**

Magnolia's pipe line system in the Eugene Island area off south Louisiana reaches 48 miles into the Gulf. Capacity of the 12-inch line operating under two-phase flow at 1000 pounds per square inch is 12,000 barrels of oil and 10,500 Mcf of gas per day.

Beach terminal points present special maintenance problems. Regular inspections at low tide show condition of pipe and coating. Coastal erosion in the Rollover Bayou area of Louisiana averages about 20 to 25 feet per year.

How One Company Solved Its Problems Offshore

Beach line and platform risers are critical maintenance sections. Regular diver inspections and corrosion surveys insure constant protection of lines.

By R. C. LEDFORD, General Manager
Marine Gathering Company, Houston

EXPERIENCE GAINED in operating an offshore pipe line since 1950 has proved one thing—that you can never consider yourself an expert in that operation.

But at the same time, it has taught a lot too, both by confirming some of the ideas used in the design of the line and developing others to take care of unexpected events that came up after original planning.

The first line laid by the Marine Gathering Company was nine miles of 8-inch to the Rollover field platform of Pure Oil Company off Vermilion Parish, Louisiana, constructed in the summer of 1950. A second main line was laid in the spring of 1953, approximately 9½ miles of 10¾-inch to the Phillips Petroleum Company-Kerr-McGee platform in the same field.

The first line was coated and wrapped with corrosion protection materials—one coat of plasticized primer, one 1/16-inch coat modified coal tar enamel, a glass fiber wrapper, a second 1/16-inch coating of plasticized coal tar enamel, and a second wrap of mica coated glass fiber. No concrete coating was necessary for negative buoyancy as the pipe, with a 0.468 inch wall thickness, had a specific gravity of 1.35 when in service.

Economics of laying pipe in the Gulf indicates a break in the feasibility of using heavy wall pipe between 8 and 10-inch sizes. So when the 10¾-inch line was laid in 1953, schedule forty 10-inch pipe was used having the same corrosion coating and wrap except that a 15-pound perforated asbestos felt was substituted for the outer glass wrap. A 1¼-inch concrete coating provided a specific gravity of approximately 1.40.

Weight requirements were determined by sampling mud from the bottom of the Gulf and testing it for density in the laboratory. This pipe design provided equilibrium of the pipe line in a mud-sea water suspension weighing 90.5 pounds per cubic foot. Tests showed maximum densities of mud in the Rollover area between 84 and 88 pounds per cubic foot.

During the summer of 1955, a 6-inch line was laid to take production from Pure's "B" Platform in the Rollover field. This line is approximately 8500 feet long. At the same time, a new 10-inch interconnection was provided between Pure's "A" Platform and the Phillips-Kerr-McGee Platform so that any excess production available from Pure Oil Company could be carried in the Phillips line.

Operations have been trouble-free. All of the gathering system is operated as a two-phase system. Both Pure and Phillips-Kerr-McGee recombine gas and condensate in their pipe lines at the platform before production is carried ashore.

At shore installations gas and condensate are re-separated and condensate is delivered back to the producers. The limited quantities of liquid hydrocarbon carried in the system do not cause any appreciable pressure drop during transportation of the gas. No pulsations of pressures in the system have been noted and pressure drops under normal flowing conditions follow the Panhandle Eastern formula very closely.

Maintenance problems. Submarine pipe lines are not readily accessible for visual inspection and are subject to hazards which do not exist on shore. For protection from mechanical damage and possible marine biological attack they are buried under the floor of the Gulf of Mexico.

Scouring by currents or wave reflection action caused by severe storms

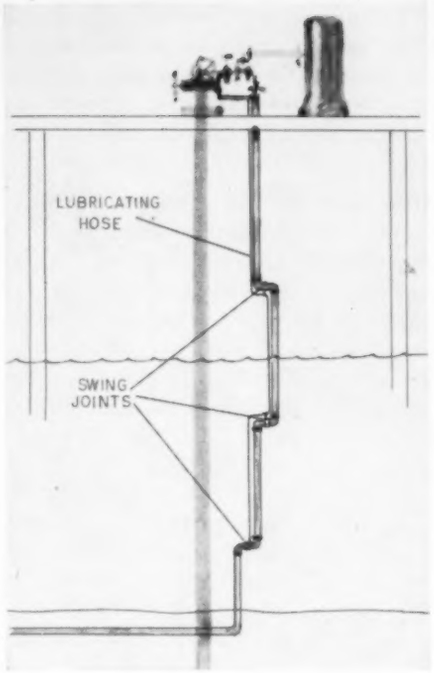


FIGURE 1—Risers at offshore platforms require regular maintenance. Marine swing joints permit freedom of motion between the pipe line and platform. Each joint is lubricated from deck fittings. Joint gasketing material is inspected frequently.

might uncover sections of line and expose them to the multiple hazards of marine traffic, ocean-born water-logged debris and other material. Divers inspect the lines periodically to determine the presence of scouring even when severe storms have not ocurred.

Terminal points require attention. The two critical sections of offshore lines are the ends. Near the shoreline, changes in beach conditions may uncover a line completely for some length or cover it with excessively deep deposits of silt. At the seaward end, corrosion protection and possible movement between the buried line, the riser and the platform require careful attention, both to design and maintenance.

At the platform, flexibility is provided by marine swing joints as shown in Figure 1. Proper maintenance of these joints is important. Lubrication is provided by high pressure hoses that trace risers upward to the operating deck.

During the early operation of the 8-inch line, difficulty was experienced with packing in the first swing joints installed. Small amounts of aromatic hydrocarbons present in the liquid stream carried along with the gas were dissolved and formed bubbles in the joint packing material. This caused the joints to open up and allow gas to leak by the packing and escape into the water.

Early inspection led to replacement with a special purpose synthetic rubber material which has satisfactorily resisted the attack of aromatics for more than three years.

Vertical risers to be protected by concrete-monel sheath. Risers often require repairs to damage caused by water-logged debris carried under the platform during storms. Debris may pound against the risers, causing mechanical damage to the protective coating. Effect of mechanical damage will be magnified in the splash zone where severe corrosion occurs if the bare metal is exposed.

One inspection of these vertical risers disclosed damage to about eight feet of the coating and wrapping which had been completely abraided exposing the bare riser to sea water. Fortunately the section was below normal water line and the cathodic protection system gave protection. A calcareous deposit of approximately $\frac{3}{16}$-inch thickness healed the abraided area, maintaining the pipe in excellent condition.

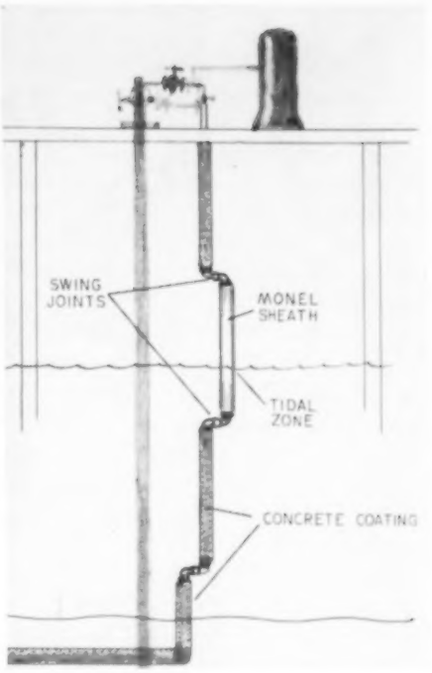


FIGURE 2—Tidal zones of risers can be affected by severe corrosion when heavy water logged debris beneath the platform pounds against the coating. Future plans call for concrete coating the riser and covering the tidal zone with a Monel sheath.

Future plans call for protection of this riser zone with a monel sheathing over the concrete coating from about 10 feet below mean low water to 12 above mean high water. This is the section most likely to be subjected to mechanical damage and subsequent corrosive attack following stormy weather.

Maintenance at the shoreward end is not easily provided. The beach line moves inward and outward either covering or exposing the line, perhaps dangerously.

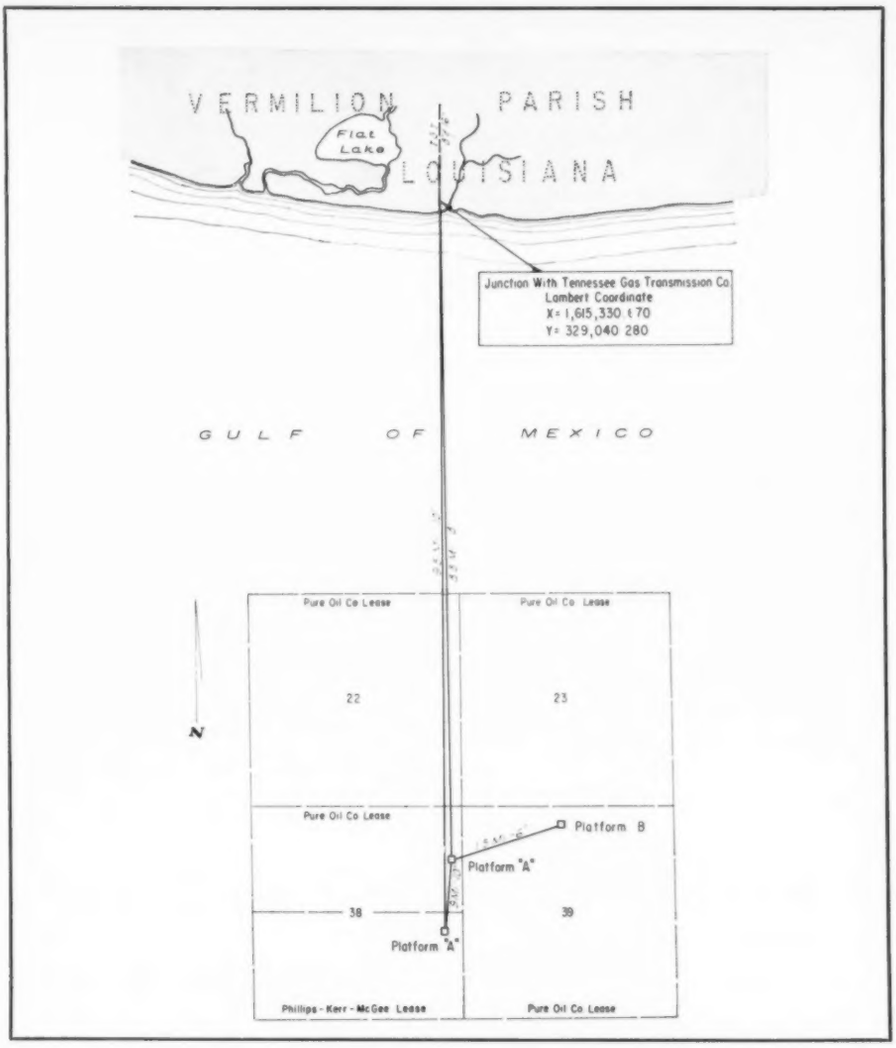
Lines are inspected regularly at every 60-days at the lowest possible tide condition.

Erosion along this section of the Louisiana coast may require the shifting of sectionalizing valves farther back from the beach. They are now only 150 feet back from high tide. Rates of erosion are not easily predicted, but data of the U. S. Corps of Engineers show a gradual erosion averaging 20 to 25 feet per year in this area.

Good corrosion protection is essential. When Marine Gathering pipe

About the Author

R. C. LEDFORD, manager of The Marine Gathering Company, has had a varied career in the petroleum, petrochemical and pipe line industries. After attending Missouri School of Mines, Ledford joined the Engineering department of Phillips Petroleum Company. Since that time he has been design engineer on portions of Dow Chemical Company's magnesium plant, construction superintendent on one of the first gasoline plants completed in Texas during World War II, and chief engineer for Barber Asphalt Corporation. At Marine Gathering Ledford has acted as a consultant on problems of design for several pipe line and construction companies concerning submarine pipe lines. Currently he is vice president of the Houston Pipeliners' Club.



Map of Marine Gathering Company's pipe line system off Vermilion Parish, La. Parallel lines operating in two-phase flow deliver gas and condensate from offshore wells.

lines were first constructed in the Gulf, cathodic protection was provided by magnesium anodes. The maximum practical potential difference that could be achieved was approximately 1.33 volts.

In designing the cathodic protection system, it was necessary to install additional anodes midway between the platform and the shore installation to protect the entire line. Piling markers were installed along the line which could be used as check points at two locations between the anode bed locations.

These markers in turn were fitted with battery-operated flashing lights to meet the requirements of the U. S. Coast Guard for navigational hazards in open Gulf waters. Lights were inspected and batteries replaced at five-month intervals.

Regular maintenance was not always possible, especially during stormy periods in winter months. As seas would frequently make it impossible to land a man aboard the marker from a boat, it became necessary to reschedule maintenance inspection more frequently to allow for the possibility of storms.

In 1955, it became possible to use impressed currents supplied from diesel driven generators on the producing platforms.

Two selenium 30 ampere, 15 volt oil-immersed rectifiers and high silicon iron anode beds were installed at the platforms. Sufficient current was impressed upon the system to provide protection along the entire length of line. The platform and beach were then used as the only two check points for the system. Intermediate station markers were removed and routine maintenance was made much easier.

A complete check of the cathodic protection system is made every three months.

The sea flexes cables constantly and failures occur as frequently as every three months. On at least one occasion, shrimp fishermen dragged their nets close to an anode station, entangling the wooden net doors with the cable and pulling it in two, requiring prompt replacement to maintain cathodic protection.

Line breaks. In the event of a casualty to the Marine Gathering line, the sudden pressure drop will close the automatic flow controllers on the patform. Normal operating pressure at the wellhead is about 1150 pounds per square inch. Should pressure drop off 200 pounds, the wells are shut-in automatically.

A boat would be dispatched from the Lake Arthur, La., station to the right-of-way. If available, a diver would be sent with the boat.

Another step would be to get a small plane at the Houston airport and fly to the station near Lake Arthur. From there the platform would be contacted by radio and advised of the inspection procedure to be used. A portable radio unit set up on the station and platform frequency would be placed in the charter plane. A similar unit would have been placed in the boat.

As the right-of-way is inspected by plane, the operators at the platform would be requested to open the valves manually. When a patch of bubbles was spotted, a marker buoy would be dropped at the location and production would be shut down. The plane would circle the marker buoy until the boat arrived and laid a larger, more permanent buoy.

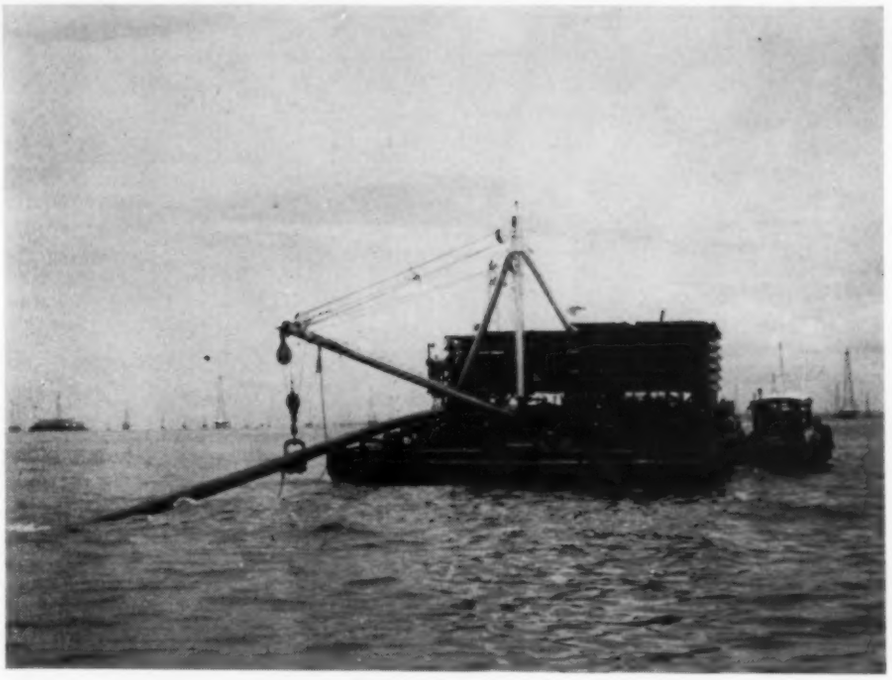
A diver from the boat would inspect the line to determine the damage and what type repair equipment was needed. After the diver's inspection, both the plane and boat would return to the station and begin arrangements for contractors and equipment.

Spare joints of pipe and emergency gear are stocked at Lake Arthur. Repair materials could be loaded on a contractor's barge along the Intracoastal Canal.

Even with quick detection and evaluation of damage, complete repairs might require as long as three to four weeks in case of bad weather.

A good rule to remember in Gulf pipelining—always plan for the worst conditions and provide for a large safety margin whether it be in weather, corrosion, maintenance or almost any other phase of operation.

—The End



Creole's Lake Maracaibo concession is a network of pipe lines, and 200 miles are being laid each year. Coatings and cathodic protection are cutting the $1.5 million annual corrosion bill sharply. Abandoned lines and stray metal on the lake floor complicate cathodic protection, but complete records on lines laid in recent years will help in the design of a protection system.

Corrosion—and 33 Years of Submarine Pipelining

Creole's experience in Lake Maracaibo shows how corrosion costs can be reduced on underwater pipe lines. The answers—good coatings, cathodic protection, and complete records.

By HARRISON T. BRUNDAGE
PIPE LINE INDUSTRY Staff

CREOLE PETROLEUM CORPORATION, in 1946, set up a corrosion control section to cut down a $1.5 million annual corrosion bill on submarine pipe lines in Lake Maracaibo—and they are doing it.

Results of Creole's current program points out many lessons for offshore pipeliners. Average economic life has been increased from 5 years for bare metal lines to 15 years for all coated lines now being laid. With improved coatings, plus cathodic protection, an average pipe life of 20 years is expected. Predictions are that the annual cost of corrosion will be cut nearly in half when the full effect of new practices is felt.

Experience with the Maracaibo pipe line network stresses the need for:

1. Maintenance of complete records on all pipe lines laid underwater
2. Cathodic protection by impressed currents where feasible
3. Protection with galvanic anodes at hot-spots
4. Use of good coatings—and care to avoid damage during laying
5. Attention to type of marine life present
6. Survey of bottom composition
7. Necessity of keeping line crossings to an absolute minimum
8. Reduction in stray metal dropped to the bottom

Lake Maracaibo, located in northwestern Venezuela with only a shallow mouth opening into the Gulf of Maracaibo, is essentially a fresh water lake. But, although the Lake's salt content is normally about only 5 percent that of sea water, it still is a good electrolyte. Also, the high mean temperature of the Lake (86° F.) increases corrosion rate greatly, and the high content of oxygen-producing algae help to keep oxygen content of the water at a high level.

Pipe line activity in the Lake began in 1923, when Standard Oil Company of Venezuela (now Creole) started developing its concession.

Underwater lines laid before 1931 were all bare. Tests for suitable coatings for service in the Lake began about 1930 and marine lines laid between 1930 and 1939 were coated with coal tar enamel. In 1940, asphalt was substituted for coal tar, but during World War II the coating program was suspended because of the shortage of trained supervisory personnel.

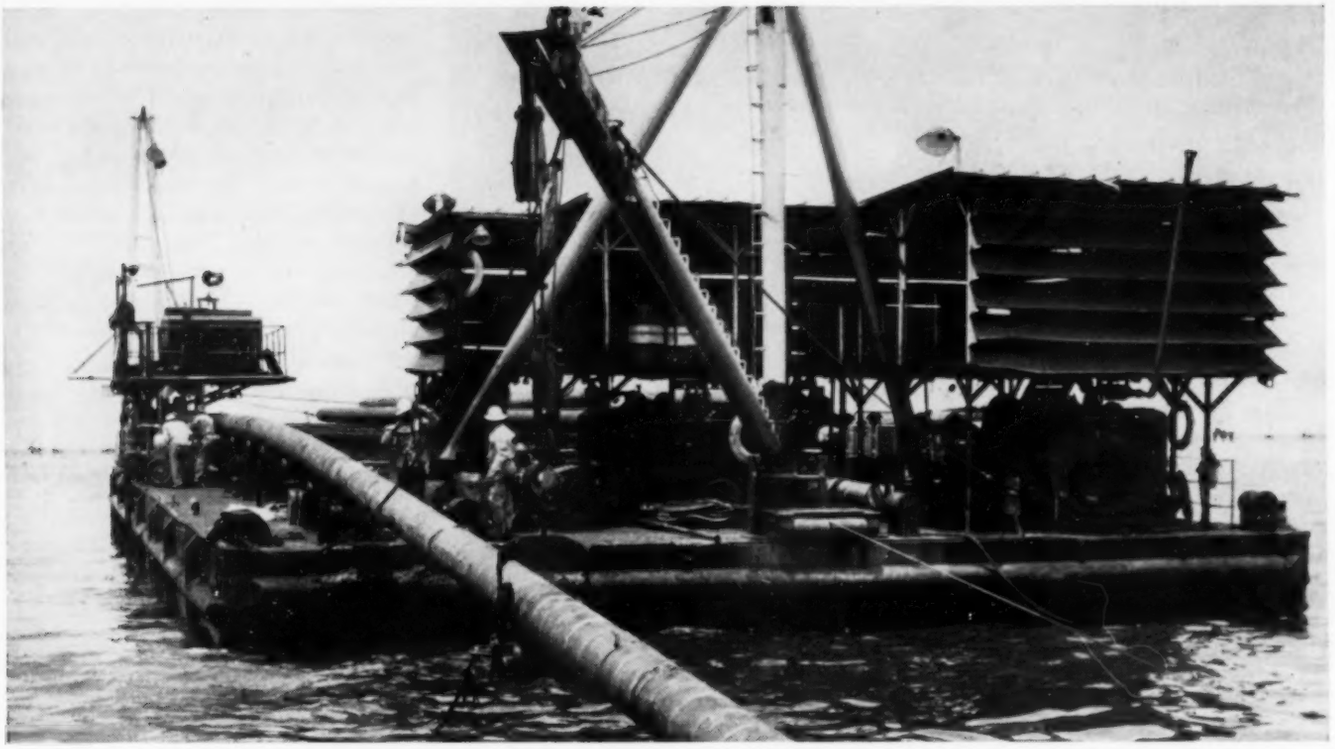
Some cathodic protection was applied to lines in 1947 and a year later Creole began the practice of installing insulating flanges at the well and flow station terminals. Special attention was directed to separating contacts between pipe lines and submarine cables, and magnesium anodes were attached to all leak clamps when repairs were made.

A double coat and wrap system was used on some lines laid in 1951. Thirty percent of the lines Creole laid in the Lake in 1952 were coated, and this increased to 98 percent in 1953. No bare pipe is being laid there now.

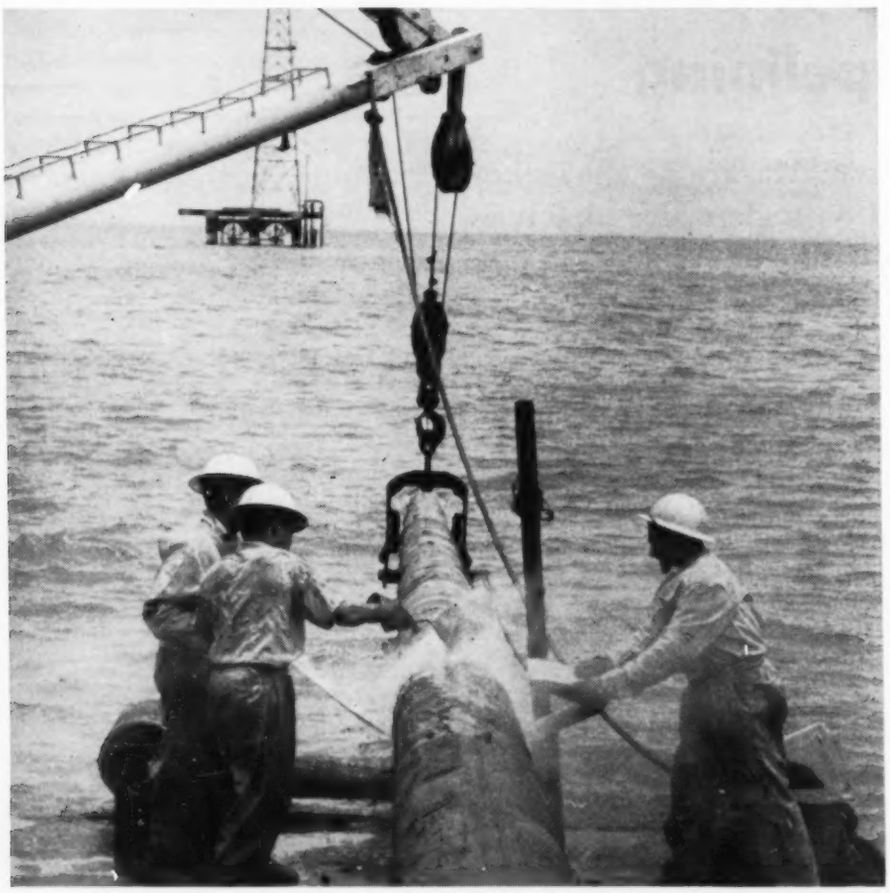
Normal coating specifications for Creole's Lake lines are: shot blast cleaning, primer, ⅛-inch asphalt enamel, glass floss, a second ⅛-inch coat of asphalt, and an outer glass fiber wrap. Emphasis is being placed on concrete coatings for Lake service too.

Complete records of submarine lines essential. One of the first steps Creole's corrosion control section took was to start making a complete record of lines in the Lake. For each line now installed the following information is recorded.

1. Location of line
2. Size and weight of pipe
3. Length of line



All of Creole's new Lake Maracaibo pipe lines are being coated and wrapped and their coordinated corrosion control program is showing results. Bare lines laid earlier in the lake had an economic life of only five years; average life of pipe now is up to 15 years, and may be 20 years when new coating and cathodic protection practices take effect.



A field joint is coated as pipe is lowered from a lay barge in Lake Maracaibo. Creole's normal Lake coating specifications are: shot blast cleaning, primer, ⅛-inch asphalt enamel, glass floss, a second coat of ⅛-inch asphalt, and an outer glass wrap. Concrete coating is being emphasized on new lines, too, as protection against the teredo "shipworm."

4. Whether the line is coated or bare

5. Service for which the line is used

6. Date of laying, and if abandoned, date of abandonment

7. All repairs

In the last few years, Creole has laid an average of 200 miles of Lake line per year, more than half of this being replacement. From 1948 to 1953, an average of 5600 leak clamps were installed annually. However, during this period, the number of clamps that had to be applied per mile of line in service decreased to one-half. At $50 per installation, this alone is a sizable savings.

Early experience with bare pipe lines in the Lake showed the most economical service life of the 4½-inch OD, 12.67 pounds per foot pipe lines to be about five years. As service was extended beyond this age, the annual cost of repairs exceeded the yearly depreciated value of the line.

In contrast, coated lines of the same pipe last from 13 to 21 years and have an average life of 15 years. Improved coatings and methods now being used should increase the average life to 20 years.

Coated 4½-inch lines cost about 26 percent more than bare ones, but average service life is tripled. Also,

this cost could be cut to 17 percent over bare pipe if lighter pipe were used as can be justified by the extra protection.

Cathodic protection of Creole's lake system is a tough problem. At present, the complete cathodic protection of the Lake system is not feasible. There are over 1800 wells and more than 85 flow stations. Total pipe surface in the gathering system is more than 7 million square feet. No insulating flanges were used before 1948, and, as a result, most of the system is tied together through flow station manifolds and pumplines.

To complicate the protection further, there are not only many unknown, abandoned pipe lines, but such things as ship anchors, chains, and other stray metal objects fouled on the submarine lines. An attempt to provide over-all protection with an impressed current system might actually do a lot of harm, especially where so many design factors are unknown.

Tests indicate that a current density of 10 milliamperes per square foot is necessary to protect bare steel in the Lake water. Much research has been carried out toward using impressed current on centrally-located scrap steel anodes to protect gathering lines; but until all bare lines are replaced with coated ones and most of the scrap can be removed, full effectiveness will not be realized.

Protection at hot spots has paid off. Line leaks are most often concentrated at certain hot spots in the Lake system. On the bare 4½-inch lines a survey showed that of 154 second clamps applied, 24 percent were installed within five feet of the first; 34.4 percent were placed within 15 feet of the first; 50 percent were within 30 feet of the first; and 64.3 percent were within 60 feet of one already on the line.

To protect these sections, Creole attaches a 51-pound magnesium anode to each leak clamp installed as a common practice unless there is already an anode within 30 feet. Each anode should protect about 40 to 80 feet of bare line for three to six years.

Between January, 1949 and mid-1951, more than 2500 leak clamps were installed with magnesium anodes attached. During this period, the rate of leaks occuring within a 15-foot radius of the clamps with anodes was reduced by 50 percent. Creole's corrosion engineers estimate the cost of applying each leak clamp-anode set at $50. The anode cost is only about $20, saving at least $30 for each additional leak prevented, not considering the value of crude and intangible losses.

Riser leaks have been a serious problem. In 1950, over 12 percent of the leak clamps were installed on risers. Creole now has a common practice of placing magnesium anodes on all risers when a new line is laid. Some aluminum risers have been installed on wells and stations.

Bottom conditions affect corrosion. Composition of the Lake bottom often varies the corrosion rate. Usually, a mud bottom tends to be less corrosive than sand. One abandoned line that had spanned a sand to mud area was salvaged and the pipe was much more severely corroded in the sand than in the mud.

About 90 percent of the leaks on Creole's submarine lines occur on the underside of the pipe.

Marine Life affects pipe. Many kinds of algae that emit oxygen and tend to increase the rate of rusting, are found floating on the surface of the Lake. Some sulfate reducing bacteria live in the Lake muds and may cause one section of pipe to be anodic to another where bacteria do not occur. But of all the marine life in the Lake, the unique teredo is the toughest. He can cause serious damage to coatings, wood, and even concrete to some extent.

The teredo healdi, as this mollusc-an borer is known, is a kind of shipworn. So far they have been found only in three localities; Lake Maracaibo, the Panama Canal Zone, and in Eastern Venezuela near the mouth of the Orinoco river. Teredos have never yet been found in water approaching the salt content of sea water, so they probably will not be a problem for ocean or Gulf lines.

But Creole's experience emphasizes the need for attention to marine growth. The teredo attacks pipe line coatings and may even start on concrete, boring into the materials with his hard calcareous head. He likes pipe line coatings and he can create a holiday in a hurry.

In seawater, barnacles and other marine life may also attack pipe line coatings. But not all marine life is harmful. Some types such as oysters can in effect protect the pipe by shielding it from strong water currents.

Several cathodic protection experiments indicate that a submarine current of four knots directly adjacent to the pipe line requires a higher impressed current to supply protection. But if the pipe line has a growth of shells attached, it may be protected even in high currents with lower impressed current requirements than might be required for a clean line.

—**The End**

A Marine Corrosion Check List

Coatings. Good coatings, proper application, and inspection are essential. Inaccessibility of pipe and cost of repairs make the best coating the cheapest.

Cathodic protection. Where feasible, complete protection to the entire system is the best answer. Hot spot protection pays. Close cooperation needed between adjacent operators.

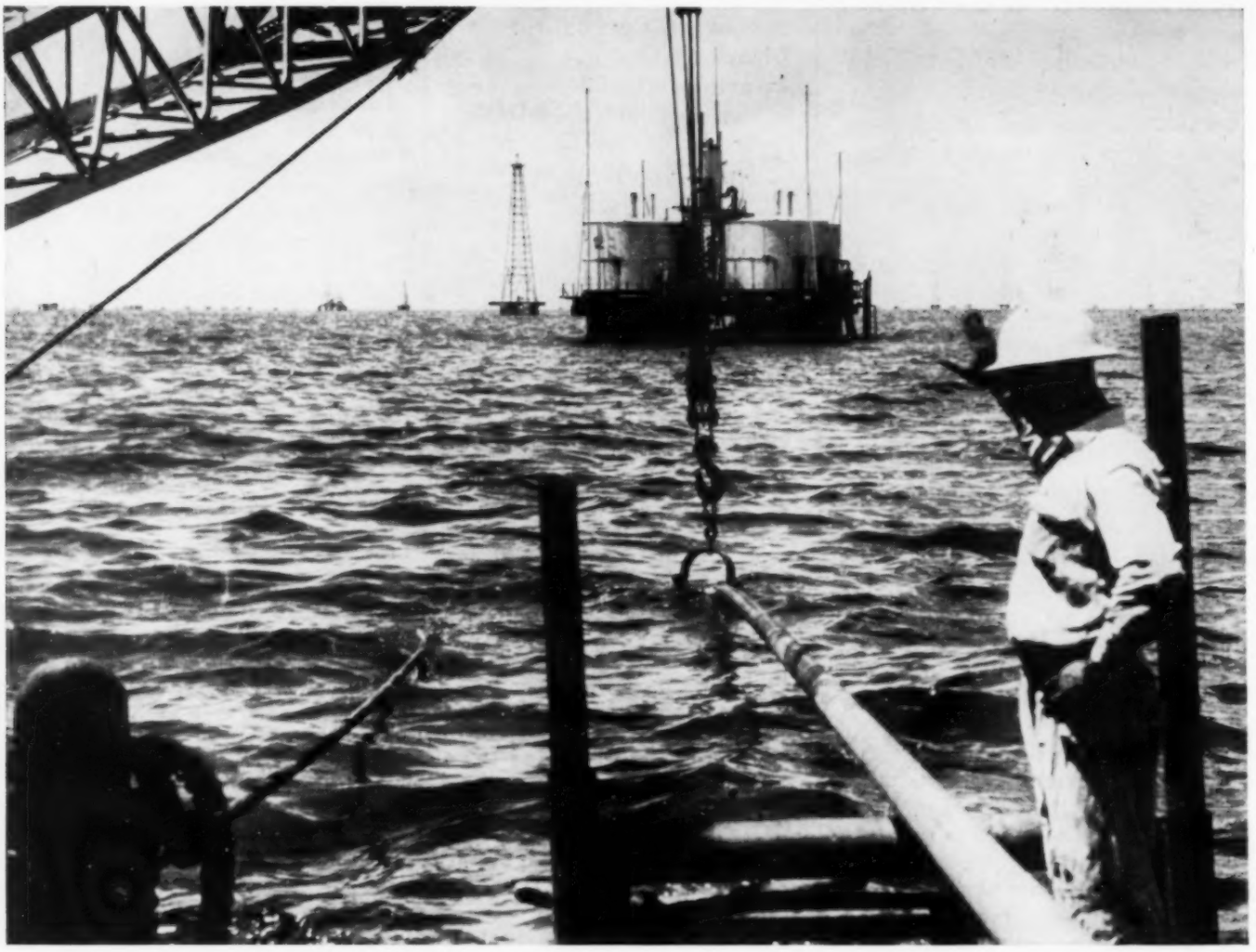
Records. Complete records on construction of each new line as to location, size, length, coating, cathodic protection and other details are a must. Creole system has given excellent results, particularly corrosion cost data. Also note any stray metal encountered.

Crossings. Should be held to a minimum. Will require coordination in cathodic protection.

Sea conditions. Strong currents may affect cathodic protection requirements. Waves and storms may uncover pipe line and expose it to damage by marine life or mechanical forces. Splash zone corrosion requires special attention.

Bottom conditions. Sandy areas particularly near silt deposits may be more corrosive. Bottom composition may affect marine life growth; generally a buried Gulf line will be protected from marine life.

Marine life. May damage coatings particularly above mud line. Some such as oysters might be beneficial by reducing currents around pipe and cathodic protection needs.



Creole pipe laying barge and flow station above are part of the more than 2000 over-water installations and 300 floating crafts in the company's 380 square miles of water work area in Lake Maracaibo. One year after Creole began requiring a four-week swimming course for all over-water workers, the accident frequency rate dropped to the lowest in company history.

Swimming Lessons: Key to Offshore Safety

Creole Petroleum Corporation's plan to test over-water workers' swimming talents has paid off. Not only are lives being saved, but employes are becoming extra safety conscious as well.

By CLIFFORD G. JANNEY, Safety Administrator,
Creole Petroleum Corporation, Caracas, Venezuela

THE BEST SALESMAN for a swimming test program is the man who has saved himself from drowning after taking the lessons.

A. Berbeci, foreman on Creole Petroleum Corporation's Drilling Barge 2159, fell 18 feet into Lake Maracaibo, Venezuela, from the upper platform of well 815. Berbeci was fully-dressed in working clothes, including heavy safety boots and gloves.

The weight of his clothes pulled Berbeci deep beneath the water. But he swam to the surface and then 30 feet to the well. Raúl Linares, a fellow-workman, put his right leg into the water from the well's lower platform. Berbeci was able to steady himself with Linares' aid until he could grasp a safety-rope dangling from the well and pull himself from the lake.

Berbeci was able to save his life because he was a graduate of a Creole Petroleum Corporation swimming course. Before attending the course, Berbeci could not swim. If he had not had that training, he almost certainly would have drowned.

Berbeci was one of the first graduates of the swimming courses conducted by the Safety Section of the Creole Industrial Relations department for employes who work over

water on Lake Maracaibo. He attended eight classes, of four hours each. And little more than one month after he had completed the course, Berbeci was able to save his own life.

Operations in Creole's Western division are entirely over water on Lake Maracaibo. There are over 2000 over-water installations, including wells and flow stations, on which employes work. There are approximately 300 floating crafts such as launches, tugs and barges, covering a water work area of approximately 10 miles by 38 miles.

Lake Maracaibo offers a constant menace to workers. The accident type most common in Creole industrial fatalities over the past several years had been drowning. All of the usual preventive measures were taken, such as the placing of life preservers on launches, flow stations, drilling rigs, barges, etc., and the placement and hiring restriction that all men transferred to or hired for over-water operations must be able to swim.

Morover, it was decided to swim-test all Creole workers then engaged in over-water operations. But Creole was in doubt as to the acceptance of such a program by the workers and, because of this, did not want to go into a large scale effort until effects of such a testing program could be determined.

Tia Juana was used as a pilot district. A tank 30 feet long, 8 feet wide and 5 feet deep was constructd into a swimming pool, incorporating all of the necessary health measures. Supervisors were tested first, then the workers, with good acceptance. After testing all 1400 over-water operations workers in Tia Juana district, it was found that approximately 10 percent could not swim.

Meanwhile, La Salina and Lagunillas districts started testing programs.

A physical education instructor was contracted by Tia Juana district to teach two divers how to serve as instructors.

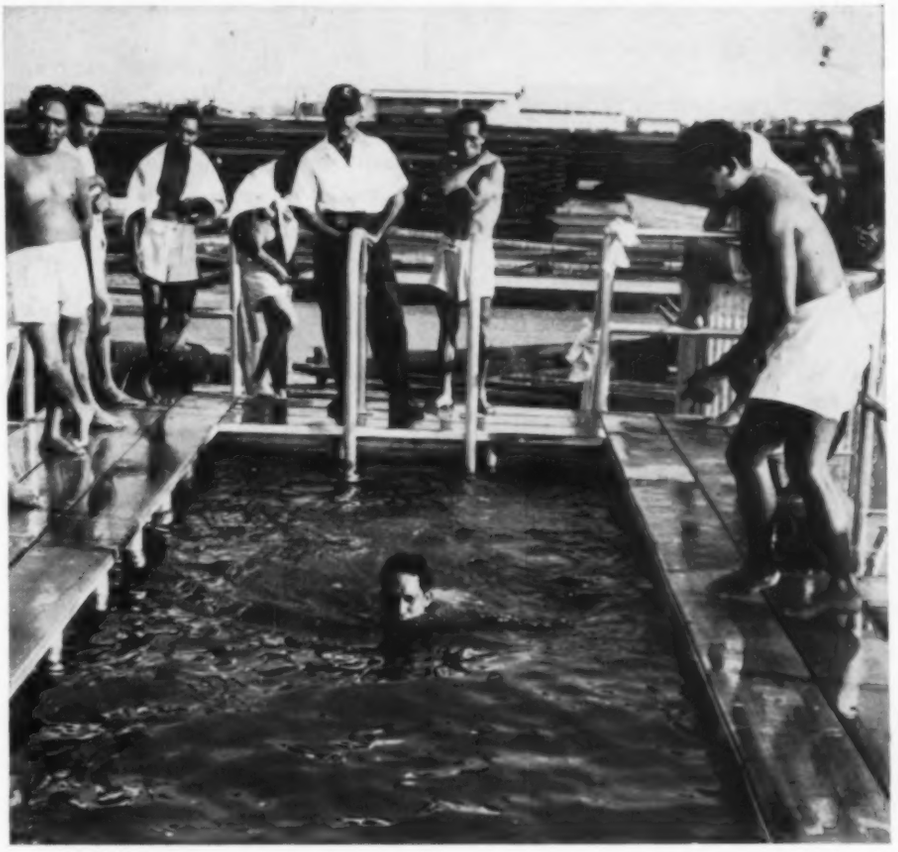
Following completion of the tests, a Creole swimming-training program was started for all over-water workers who required instruction. The swimming classes are conducted on company time, four hours per day two days a week for four weeks. During the first two courses, 24 workers were taught to swim out of 28 who attended.

To assist a worker who falls into the lake, a steel cable has been stretched around the piles of the 97 over-water production flow station platforms, a few inches above the water line. The cable leads to a ladder by which a person may climb from the water to the platform.

Besides the immediate results of having every over-water worker able to swim, a by-product of the Creole swimming training program is becoming evident which in the long-range, accident-prevention program may overshadow the original intent of the swimming program: Each worker graduating from the swimming training program is more appreciative of the efforts of Creole management to prevent accidents. This program is proving most effective in instilling safety-consciousness in Creole workers.

Management emphasis on the importance of safety, accepted by line organizations of their safety responsibilities, and a well-staffed safety organization available to assist have continued to produce steady annual improvement in Creole's safety record.

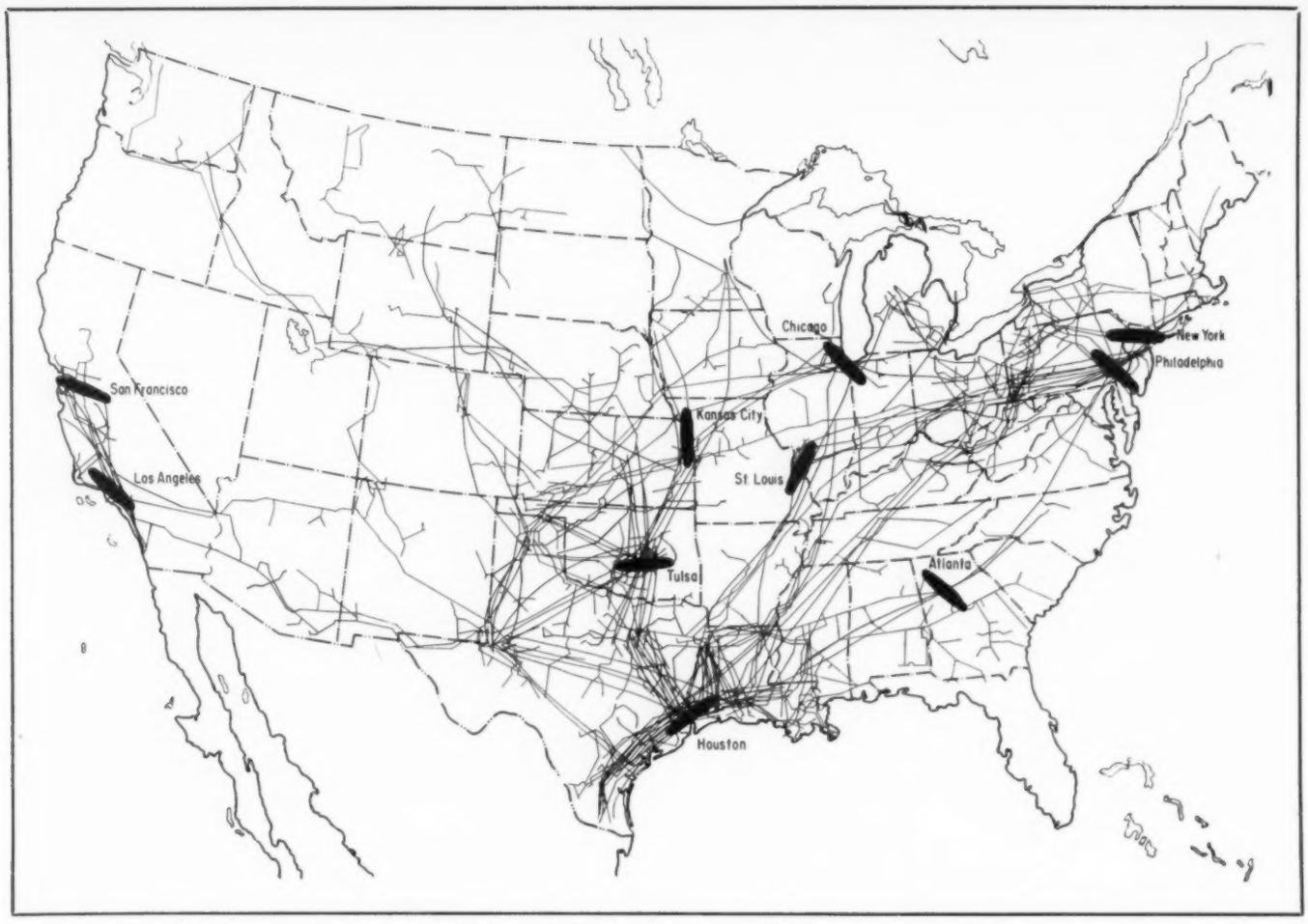
A year after the course began, the Creole accident frequency rate was down to 4.4, lowest in the company's history. —**The End**



In Creole's onshore swimming tank, Drilling Foreman A. Berbeci is shown receiving training which a short time later enabled him to save his own life. Around the tank are members of a typical safety swimming class.

About the Author

CLIFFORD G. JANNEY graduated from Louisiana State University with a B.S. degree in electrical engineering in 1941, at which time he joined Westinghouse Electric and Manufacturing Company as sales engineer. During World War II he served with an airdrome squadron located in the Pacific. In 1946 he was employed by Standard Oil Company (New Jersey) in the Safety department of the Baton Rouge refinery, transferring in 1949 to Creole Petroleum Corporation as a district safety supervisor. In 1950 he was named Western division supervisor, and in 1952 was appointed to the safety administrator's job at Caracas.



Over 50 percent of the pipe line facilities would be affected by blast damage and fallout resulting from a hydrogen bomb attack on ten major terminal cities. Potential 140 by 20-mile fall-out zones are shown by black areas. Defense efforts would be curtailed severely.

How Vulnerable Are Our Pipe Lines?

Buried facilities would suffer little direct damage from enemy nuclear attack, but blows at ten critical points could reduce capacity to less than 50 percent of normal.

By NEIL P. HURLEY, S.J.
Fordham University, New York City

ALTHOUGH ARTERIES of our pipe line industry are buried and protected from possible enemy attack, there are several "pressure points" where damage could be crippling to the nation's defense network.

A glance at the results of the Operation Alert civil defense exercise of June, 1955, points out the weak spots. Intense, widespread damage was inflicted on leading pipe line facilities in many areas chosen for the simulated nuclear bomb attack. Nine pipe line centers in the target zones were badly "damaged" in the mock raid. Hardest hit were Chicago, Los Angeles, San Francisco, Toledo, Kansas City, St. Louis, Houston, Providence and Atlanta.

At present there are about 330,000 miles of pipe lines transporting crude, products and natural gas within the U. S. By 1975 this figure will reach an estimated 525,000 miles. Without

these arteries for continuous transportation, the production, refining, distribution, storage, and retailing segments of the oil industry could not operate. This fact can become alarming when the results of past defense exercises are reviewed.

Pipe lines, like all transport lines, are deployed in space, and even when bombed are capable of being restored readily. However, there are definite "pressure points" in America's pipe line network.

Over 50 percent of all U. S. employment in the pipe line industry is concentrated in two states; Texas has 36 percent of the nation's entire pipe line personnel and Oklahoma has 14.2 percent. Dallas and Houston are leading pipe line centers. Each city has about 7.2 percent of the pipe line people in the industry. Thus, one out of every seven trained pipe line employes lives in one of these two potential target areas.

Both cities are within attack range of enemy bombers, and Houston is located near enough to the sea to be accessible to nuclear attack by one or several of Russia's 350 snorkel submarines. These vessels are capable of traveling up to 18,000 miles, and Houston, as the largest refining-petrochemical center in the U. S., would rank high on any enemy target list.

This is true of other key pipe line terminals. Some, like Chicago and New York, are centers of finance, trade, industry, utility and rail services. Of the ten leading metropolitan areas, seven are major pipe line terminals (New York, Chicago, Los Angeles, Philadelphia, St. Louis, San Francisco, and Kansas City).

Pipe line facilities are interlaced into a network in the Texas-Oklahoma area, and are further centralized in the Middle West and the Middle Atlantic states. All three areas are within long-distance range of Soviet bases. Chicago, Kansas City, St. Louis, New York, Philadelphia, are all within a 3500 mile great circle radius from such Soviet bases as Magnitogorsk, Murmansk and Vorkuta.

Though more distant from a great circle approach, pipe line targets such as San Francisco, Los Angeles, Dallas, Houston, Oklahoma City are within Soviet air reach by virtue of the phenomenon known as the jet streams.

Food for thought . . . on pipe line defense.

- **Nine major U.S. pipe line centers were heavily "damaged" in the last mock nuclear attack.**
- **50 percent of all skilled pipe line personnel are located in Texas and Oklahoma.**
- **One out of seven pipeliners lives in the Houston or Dallas areas.**
- **All major pipe line centers are within reach of Russian bombers and many are in high priority target areas.**
- **Five of these centers are also within range of nuclear attack by submarines.**

High altitude air currents increase enemy bomber range. The jet stream is a current of air which generally moves from west to east at a speed varying between 100 and more than 400 miles per hour. It shifts constantly, though ordinarily it curves southward in wintertime and northward in summertime. Meteorologists now can predict, with reasonable accuracy, where a jet stream will be and how fast it will be travelling at a given time.

Soviet bombers conceivably could ride the jet streams down the Pacific Coast into Mexico and then northeast into the Gold Coast crescent.

Virtually all pipe line terminal cities would be found as "sitting ducks" beneath such a route.

In a war, operating pipe lines are vital. Though severest damage to pipe line facilities would come from primary atomic attacks on central junctions where personnel, controls, equipment, and records would be found, gathering lines could be adversely affected, too. Despite the devastating zones of destruction a 40 megaton H-bomb could impose on an area, the recuperative potential of pipe lines themselves would be high. This was proved by the U. S. Strategic Bombing Survey which indicated that rail damage in Japan was restored rapidly, even following atomic destruction.

Apart from the fact that crude oil lines terminate in cities with large refineries and large markets, products pipe lines are vulnerable in that they are tied to refineries and water terminals and extend to bulk terminals located near principal points of consumption. The economics of distribution dictate this pattern, but in emergency periods water transportation becomes impossible due to the offshore threat of lurking enemy craft.

Economy and flexibility of water movement regarding oil transport in peacetime drains a large part of the transportation burden from pipe lines. In wartime, however, pipe lines are operated at peak capacities.

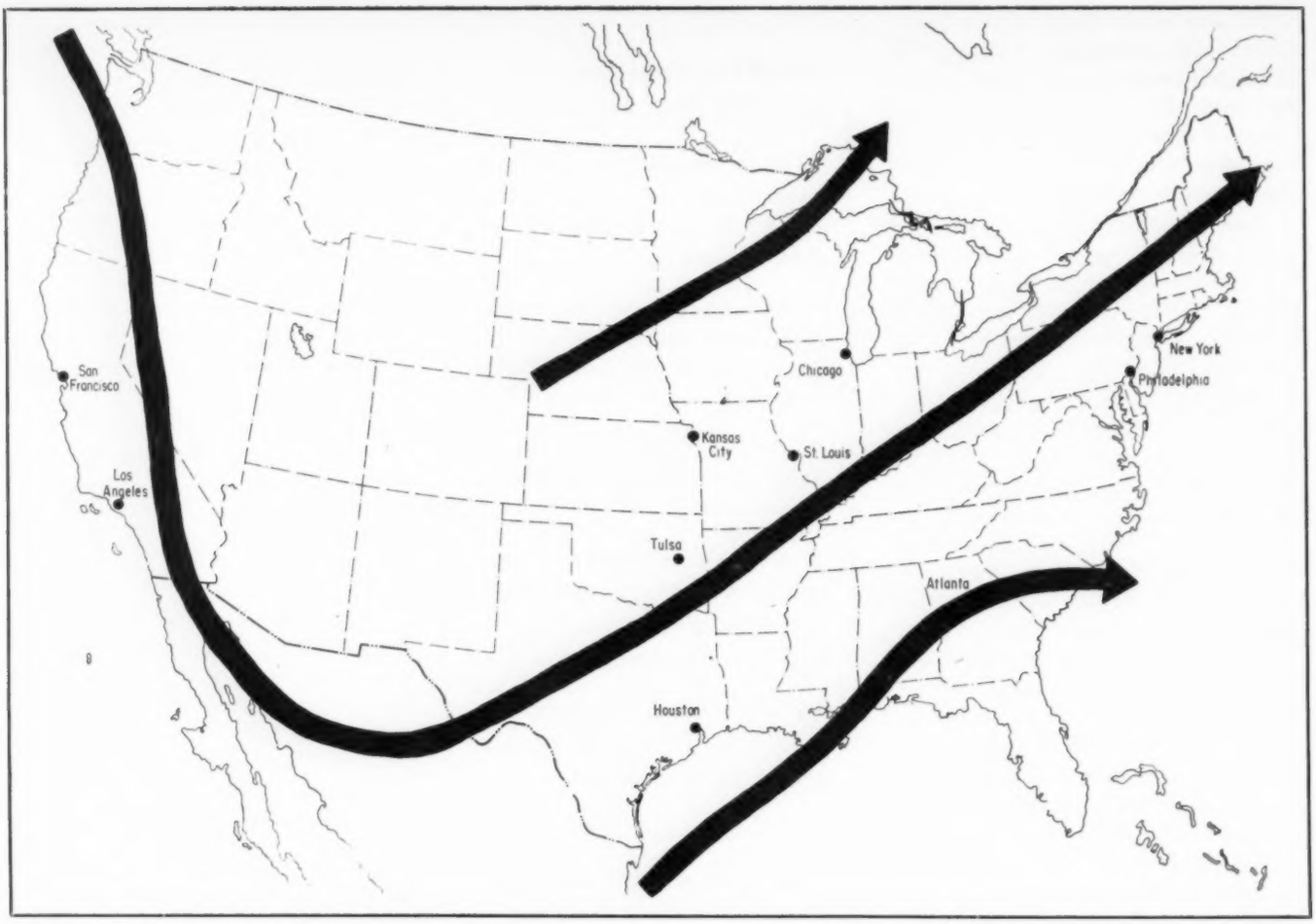
During World War II pipe lines proved their effectiveness in the emergency transportation of oil. Prior to the war, 95 percent of the petroleum used on the East Coast involved transport by tankers. During the war, tankers carried only 22 percent of the load after completion of the Big and Little Inch pipe lines. These lines helped solve the shortage of oil transport facilities to the East Coast.

Emergency plans call for steel, equipment and trained men. The difficulties of building and replacing pipe lines in times of emergency can best be illustrated by the government's efforts in World War II, when 35 major pipe line projects, and a number of others not included in the official program, were underwritten at a cost of $333,658,000. Of this amount, the government supplied $154,206,000; private industry furnished $179,452,000.

One of the more serious problems was the availability of steel. Despite the attempt to utilize second-hand pipe as often as possible in major projects, large quantities of new steel still were required.

Steel is a dramatic instance of the serious damage which secondary effects of area bombings with nuclear weapons might cause. If a third world war should follow the pattern of World War II by starting out as a "lightning war" and ending as a war of attrition, then steel will represent a vital chink in the armor of the pipe line industry.

It takes over 164,000 tons of steel to build 1000 miles of 20-inch crude oil pipe line, including stations and



High altitude air currents, "jet streams," increase the effective range of bombers from Soviet bases. All pipe line facilities in the U. S. are now within range.

tankage. Pipe lines would thus be greatly affected by the vulnerability of the iron and steel industry.

Attack on other industries would slow repairs. Over three-quarters of the entire U. S. annual ingot production is centered in ten areas: Chicago-Gary; Pittsburgh; Youngstown; Weirton, W. Va.; Detroit; Baltimore; Buffalo; Cleveland; Bethlehem-Morrisville axis, and Birmingham. Steel also could be curtailed production-wise by striking at power facilities and coal areas in the Great Lakes and Pennsylvania areas.

In an atomic Pearl Harbor, a chain reaction of adverse effects will be set up by the loss of production in basic supply industries. Though it is difficult to predict the indirect effects of area bombings, it is safe to say that new pipe line construction would be sharply curtailed if major steel producing facilities were H-bombed.

The high degree of automation and instrument control developing in the pipe line industry makes it functionally dependent upon the manufacturers of equipment such as "feedback" devices and servomechanisms. Some 52 percent of all personnel in the production of instrument controls are centered in three regions: Rochester, Newark-New York, and Minneapolis-St. Paul.

Apart from the fact that the pipe line industry is in "lock-step" with a highly-nucleated industry, the centralized control of continuous-flow operations in the pipe line industry would add another area of vulnerability. Should the central control panel be bombed, remote pipe line operations would be immediately affected, until electronic or manual controls were restored.

Even with increasing use of automatic control, pipe lines will still depend upon trained manpower for their operation. Skilled personnel and know-how are indispensable. The construction, laying, maintaining and repairing of pipe line facilities basically are the work of experienced men using the right equipment.

Atomic warfare has posed a new dimension of destruction to man—

Here are steps that can be taken NOW.

- **Make plans for the emergency restoration of operations.**
- **Consider standby facilities for pumping stations, generators, and control equipment.**
- **Stockpile necessary reserves of key machinery and equipment away from likely target areas.**
- **Set up plans for personnel assignment and train men for duties of supervisors and management, should they be needed.**
- **No planning will be complete, but it will lessen the shock if an attack occurs.**

radioactive fall-out. The cigar shaped shadow, 140 miles long and 20 miles wide, could do irreparable damage to the health of pipe line employes living in such areas as Chicago, Wood River, St. Louis, Kansas City, Los Angeles, San Francisco, Philadelphia, Cleveland, and New York.

For example, suppose that the Gulf Coast area were bombed by nuclear weapons. This is not unlikely when we recall the words of the U. S. Strategic Bombing Survey with regard to Germany: "Measured in terms of results achieved, the two most important objectives were the German synthetic oil industry and the German transportation system."

Nuclear bombing of the Gulf Coast area would jeopardize the lives of all petroleum, natural gas, and pipe line employes in the downwind area contaminated by the radioactive ash. Of the 25,000 employes in the industry, some 1800 are in Harris County, Texas. Unless those surviving got into shelters immediately, a heavy roentgen dosage could kill or inactivate human beings in the area.

Undoubtedly, diversion of personnel from daily activity will be the most serious cause of production curtailment. This was proved in Germany in World War II, when able workers were diverted from ordinary tasks to recuperative work such as giving first aid, restoring vital communication and transport lines, dispersing industry, and digging underground facilities.

Even if workers in a stricken area survived unharmed, the need for volunteer welfare workers would necessitate their cooperation in emergency rescue work.

A National Industrial Conference Board study (Damage Control in Wartime) cited the experience of European pipe line operators in certifying the amount of damage which can be inflicted on pipe lines in disaster. Though underground they are difficult to protect from severe percussion, especially in the event of hydrogen bombs.

The Operation Ivy test in March, 1954, at Eniwetok left a crater some 125 feet deep. It will be possible to construct H-bombs and cobalt bombs with three times as much destructive potential as that which was released in the Pacific in 1954.

What can be done now? Though the U. S. Government has had a dispersal program for over five years, pipe line facilities, together with all facilities with no fixed location, were not included in the program. This does not mean that nothing can be done by way of passive defense measures to bestow some degree of atomic immunity on pipe line facilities.

Because of their inexorable tie-in with refineries in major marketing areas, one observer has indicated that "The refineries are so logistically important that their destruction would be directly and immediately reflected on the field of battle. Destiny has it that the refining industry must face attack by atomic bomb, if war should come."

We might add that major pipe line terminals likewise must face atomic attack since they are adjacent to refining areas.

With many waterway bottlenecks at the Panama Canal, the St. Lawrence Seaway, the Soo Canal, the major harbors, and the inability of tankers to ferry oil along the coastline, pipe lines will play an important part in any future protracted warfare engaged in by the U. S.

World War II gave an example of the ability of the industry to cope with shortages and obstacles. New projects to transport oil to the East Coast involved reconditioning of pipe which had been dug up, the reversing of lines from crude to products lines, looping, and conversion. Similarly, in the event of atomic disaster, by-pass lines and looping arrangements can restore operations that have been discontinued. The industry is one with remarkable powers of resilience.

The nation's pipe lines solved a critical transportation problem in World War II; there is no reason to doubt that this feat could be duplicated. However the complexities modern warfare presents must be faced. One plane is capable of dropping ten times the amount of high explosive bombs (28 million tons) which the entire Allied Air Force dropped on Germany during World War II. The new dimension of terror includes thermal radiation, blast damage, gamma radiation and the release of free neutrons, and radioactive fall-out.

The Oil and Gas division of the Department of the Interior, with the National Petroleum Council, has been concerned with the defense of the petroleum processing complex in this nation. Two booklets have been issued which lay down fundamental principles of security and disaster control. The first, issued in May, 1955, is entitled "Security Principles for the Petroleum & Gas Industries." The second is "Disaster Planning for the Oil & Gas Industries."

Industry has been made defense conscious by such disasters as the Texas City disaster in 1947, and the more recent refinery blast in Whiting, Ind. Such civil disasters are slight reminders of what could happen.

Wherever possible, plans for restoration of pipe line operations should be laid. Standby facilities for pumping stations, electric generating units, control machinery should be provided; reserves of key machinery and equipment should be stockpiled away from the major metropolitan areas where terminals are located; trained personnel should be ready to take the place of supervisors and higher echelon officials in the event of their death or inability to carry on.

Carefully prepared plans can mitagate the shock somewhat and can give the enemy pause in contemplating an attack on a nation which is alert and ready for revival. —**The End.**

About the Author

NEIL P. HURLEY, S.J., has a degree in accounting and an M.A. degree in political science from Fordham University. He is completing work for his Ph.D. at Fordham in 1956. Rev. Hurley's background includes work with an advertising firm, an accounting firm on Wall Street, and as an economics teacher at Fordham. In studying the industrial mobilization plan as related to the Government's tax amortization program, he studied the automobile industry, the chemical and petroleum processing industries, and to complete this research project, the iron and steel industry. During these studies he contacted top industry leaders and various government agencies including the ODM, the Commerce Department's Business and Defense Services Administration, the Industrial College of the Armed Forces, Federal Civil Defense Administration, and Department of Defense.

Conditioning Gas for Transmission

New high-capacity solid adsorbents and use of more concentrated glycols promise improvements in gas dehydration.

By A. L. KOHL and F. C. RIESENFELD
The Fluor Corporation, Los Angeles

INTRODUCTION OF THE new and more efficient dehydrating agents is leading to improvements in design of gas treating systems. Greater use of automation with recording instruments and controls presages the ultimate goal of automatic control of treating plants.

Special Developments. A rather special development in the field of gas treating which has been disclosed during recent years may be mentioned. In one application of this system, a gas stream containing very large amounts of acid gases, up to 90 percent, was treated with a concentrated aqueous amine solution. The purpose of this operation was to absorb the acid gas in a minimum volume of solution so that it could be transported by truck to a regenerator located at some distance. Because of the very high heat of reaction evolved in this process, a special scheme was devised which consisted of absorbing the bulk of the gas by concurrent mixing with the solution in a water cooled heat exchanger, followed by countercurrent absorption of the final traces. This system operated quite successfully and is described by Bechtold and Kohl.[23]

During the latter part of 1954 the Amine-Salt process was disclosed. This process, according to its inventor, has the benefit of appreciably reduced corrosion of regeneration equipment and reduction of chemical losses.[24]

Finally, considerable progress has been made in the development of techniques for more accurately designing absorption and stripping columns. The rate of absorption of CO_2 in aqueous MEA solutions, which involves simultaneous absorption and chemical reaction, has been studied quite extensively,[25] and plate efficiency correlations have been developed to serve as a new tool for the process designer.[26]

Dehydration. The subject of natural gas dehydration has received considerable attention in the recent literature, as there are several excellent articles describing the general problems and techniques used to remove moisture from gases.[27, 28, 29, 30, 31, 32] No attempt will be made to discuss these. However, certain recent developments need to be evaluated.

A primary purpose of gas dehydration is to prevent the formation of hydrocarbon hydrates which can plug valves and transmission lines. Another purpose is to prevent the condensation of liquid water in transmission lines as this can reduce line efficiency and, in the presence of acid gases, can lead to very severe corrosion. A very spectacular case of gas transmission line corrosion has been described recently by Paredes and Mize of El Paso Natural Gas Company.[33]

If maximum dehydration and consequently very low dew points are required, dry desiccants are the only means by which this can be achieved. The initial installation cost of dry desiccant type plants operating at pressures of 500-1000 psi is about twice that of a plant using liquid drying agents. Furthermore, the use of conventional dry desiccants appears to be definitely uneconomical if the gas temperature is above 100° F., and precooling of the gas to at least 100° F. is necessary.[34]

In order to reduce the initial cost and the operating expenses of solid dehydration systems, high capacity desiccants are desirable. A recent development in this direction is activated alumina H-151 which is said to be capable of absorbing water to the extent of 12 percent of its weight after extended use.[35] This figure is based on operating conditions of 600 psi and higher and a water content of the gas at the saturation point of 7 pounds per million cubic feet. The material is very tough and the attrition losses are very low. Data have also recently been presented on field tests of a granular silica gel[36] dehydrating natural gas. These tests showed the material to have an initial capacity of about 22 percent water which dropped to about 11 percent after one year's service.

The use of Socony Mobil's beads for natural gas dehydration is well established and will not be discussed at this time. Because all of the solid desiccants are subject to a reduction in capacity with continued use, a design loading of about 6 percent water per cycle is typically used.

An interesting, very recent development is the introduction of the so-called molecular sieves.[37] These molecular sieves are crystalline, sodium and calcium alumino-silicates with controlled pore sizes which will absorb molecules of a certain size and reject

PART 2

molecules larger than the pores. These materials are reported to have very high capacities for water, on the order of 18-20 percent by weight, and are capable of dehydrating gas at elevated temperatures (200° F. or more). However, they do have the disadvantage that quite high temperatures are necessary for the complete removal of the water from the adsorbant.

While ordinary desiccants such as Bauxite and silica gel are essentially water free at temperatures on the order of 350-400° F., temperatures as high as 600-700° F. are necessary to completely strip the molecular sieves of their water. At present, insufficient information is available on the use of molecular sieves so that a final evaluation of these materials will have to be made in the future.

The most widely used system for pipe line gas dehydration involves the use of polyhydric alcohols, especially diethylene glycol (DEG) and triethylene glycol (TEG). Although DEG is most commonly used, TEG has found many applications in recent years. The reason for this change is that TEG is thermally more stable than DEG and can therefore be used in higher concentrations. It is possible to employ TEG solutions containing as little as 2 percent water without vacuum regeneration and, consequently, to obtain dew point depressions up to 65° F. By using vacuum regeneration systems, relatively low regenerator temperatures can be maintained, and water concentrations of the solution can be reduced to a few tenths of 1 percent.

The corresponding dew point depressions are on the order of 100° F.[38] The low vapor pressure of TEG permits operation with chemical losses on the order of 0.1-0.25 pound per million cubic feet of gas, which is about one half of the losses incurred with DEG under comparable conditions. As stated above, TEG is considerably more stable than DEG and it is reported that at temperatures of approximately 400° F. TEG decomposes at about one-sixth of the rate of DEG. The decomposition products are mostly vapors which are removed in the regenerator. Both DEG and TEG can be freed from heavy decomposition products by redistillation under vacuum.[39] The decomposition of DEG and TEG and corrective measures to prevent it has been investigated by several authors.[10]

The results of this work indicate that the decomposition of the glycols is due primarily to oxidation and that addition of MEA, phosphates and buffers appears to be effective in reducing corrosion caused by decomposition products. Successful use of the corrosion inhibitors in glycol systems has also been reported.

Glycol amine systems containing MEA and DEG or TEG are comparable in their dehydration capacity with glycol solutions of the same water content. The selective amine, MDEA, can also be used in combination with glycol and selective H_2S removal, and simultaneous dehydration can be effected.

In recent years, interest in the protection of gas gathering lines against corrosion and hydrate formation has increased. As a result, many operators now dehydrate gas at the wellhead. In most cases, it is not necessary to dehydrate wellhead gas as completely as transmission line gas, and a dew point depression of 45° F. is satisfactory. This permits the economical use of glycol systems even for gases of relatively high temperatures. Since relatively small volumes of gas are involved in these operations, they are very well suited for the application of fully automatic package type units. A large number of these units are operating very successfully in many gas fields in this country. Finally, the injection of hydrate preventing agents such as alcohol and glycol is practiced to some extent. It seems that injection of glycol is more economical; however, this technique involves the disadvantage of glycol removal from the line, reconcentration, and transportation to the injection point.

What this progress means . . .

Summarizing the progress made in the technology of gas conditioning during the past few years, the following conclusions are indicated:

- In the field of particulate matter removal, major emphasis has been on the development of techniques for evaluating equipment performance, and a growing tendency toward very high efficiency removal of all particles is apparent.
- Gas purification technology has been advanced by the introduction of several new systems to minimize chemical losses, corrosion and steam consumption. The corrosion problem is still present to some extent, and additional work is being conducted.
- Regarding dehydration, recent developments include the introduction of new, high capacity solid adsorbents and the use of more concentrated glycols, particularly TEG, in liquid dehydration plants.
- The future will undoubtedly bring increased automation of gas conditioning operations. There are already instruments available for the continuous recording of dew points and hydrogen sulfide content of gases. It is only one step further to the combination of these with control instruments of advanced design now available, for fully automatic plant control.

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An acknowledgment and earlier references appeared with Part 1, April 1956 Pipe Line Industry.

Which man are you?

He CANNOT produce effectively.

He CAN produce effectively.

Can You Relax?

Here's what one company learned about tension control. By practicing relaxation, employes worked more efficiently and were happier in their jobs.

EXCESSIVE NERVOUS tension is a growing problem in modern industry. If allowed to go unchecked the following physical reactions appear among all levels of personnel:

- Irritability.
- Reduced efficiency.
- Chronic fatigue.
- Varied physical disorders—imagined and otherwise.

On the other hand, the ability to recognize and control excessive tension can contribute to the productivity, health and happiness of personnel in any industrial operation.

Industry is fast becoming aware of the importance and potential of successful tension control for its employes. As time goes on and scientific methods are applied by still more companies, it may well develop that they will have far-reaching effects in improving the business and personal life of large segments of the working population.

What is excessive tension—and how can it be curbed?

All during the day, everyone engages in a series of activities that involve the contraction of muscles throughout his body. If these muscles are maintained in a state of abnormal tone—tension—for any reason, the output of effort in the conduct of the day's work is correspondingly increased and may be excessive.

The fatigue that results from overstimulation sometimes is not apparent until many people find themselves in a state of general fatigue. Tensions built up during the day continue, and often the cares of business go home with them.

Recognizing the importance of tension control to its employes in both their work and home life, Ethyl Corporation two years ago began to investigate the possibilities of doing something about it under its industrial relations program. Since that time, Ethyl, with gratifying results, has provided instruction in tension control for some of its executives and supervisory employes.

The method employed has been widely used for more than 35 years. It was developed by Dr. Edmund Jacobson, of Chicago. Since it was first introduced, the method has taught thousands of people how to operate their bodies so that they can enjoy calmer, happier, healthier and more profitable lives.

Other doctors and laymen have been trained in the successful use of Dr. Jacobson's methods, and he and these men have taught it to many men and women of various ages and occupations. In addition, U. S. Navy air schools have used the methods with good results in training more than 15,000 cadets.

People who have been helped by the methods endorse their use enthusiastically. The president of a nationally-known business concern says that after he undertook the training he achieved a degree of tension control he had never thought possible.

A high-ranking officer in the Navy tells of his experience: "Before World War II, I suffered a complete breakdown. My doctors told me I would

have to retire and work at one-third speed for the rest of my life. But I learned of this method of easing tension and worked at it seriously. During the war, I was able to work 12 or 14 hours a day in Washington, board a plane for a long trip, turn myself out like a light, and get off at my destination refreshed and ready for another long day. The ability to achieve tension control not only changed my life, I feel it saved it."

Navy air cadets who took the course reported help in the ability to sleep longer and more soundly; to do better in academic and physical training; to be more relaxed before and during competitions; and to do a better job of flying. At the same time, the total number of days lost from injuries among cadets receiving the tension control training was reduced 38 percent.

The scientific system of tension control requires full participation in developing new habits, but if it is followed faithfully the step-by-step procedure can bring impressive results. The more exactly it is followed and the longer it is pursued, the more benefits it provides.

Muscular Control the Key

In approaching the subject, it is important to understand that tension control is achieved by gaining muscular control. When a businessman learns to relax all his muscles except those needed to perform the task at hand, he is able to accomplish more work and be less fatigued at the end of the day. He will be happier in his job and in his home life. He will sleep better and his entire life will be better.

Many businessmen, of course, are tense without realizing it. When their legs are crossed, their forehead wrinkled, sitting or standing stiffly, or when the muscles in their neck and shoulders are contracted, they are not completely relaxed. Similar small tensions, of which many men are totally unaware, constantly tighten the muscles all day long, building up pressures that lead to mistakes and other difficulties and increasing fatigue.

A review of a few physiological principles help explain why this is so. If a muscle is tense, it is contracted, and therefore it is in use. Even the slightest mental or bodily activity includes the contracting of some muscles. But muscle contraction also includes nerves. About half of the nerves in the body are used to alert the muscles or carry messages from the muscles to the brain. The activity of the nerves, electrical in nature, moves along the muscle like a wave, with a rapid discharge rate. When this discharge rate is greatly increased, there is high nerve tension and the muscle becomes rigid.

Since the nerves are in action whenever a muscle is tense, it follows that the relaxing of the muscle includes the easing of nerves. The relaxing of any set of muscles will begin to stop the spread of nervousness to the other areas of the body and thus restore calmness.

It Takes Practice

Practice is an essential part of the tension control methods. Those following them are urged to fix a particular time of day for practice. At least a half-hour is recommended and an hour is much better.

The practice consists of tensing and relaxing various muscles of the body. These manipulations teach you to become aware of tension, to recognize it whenever and wherever it occurs in your body, and to control it effectively. A large part of each practice session is also spent in complete relaxation.

Skill at tension control is put to a practical test, of course, in everyday activities. Differentiating between the muscles that must be tense to carry out necessary activities and those which are not needed and consequently should be relaxed, and relaxing them, is the goal.

In its awareness of the importance of tension control to individual employes, Ethyl Corporation in 1953 examined Dr. Jacobson's methods. As a part of this investigation, which was headed by C. R. Holton, Ethyl's industrial relations director, ten of the company's top executives took Dr. Jacobson's course in tension control. The results were favorable and it was decided to make the program available to more Ethyl personnel.

Accordingly, Ethyl's manager of training was trained as a qualified instructor. Since then, he has conducted three ten-session courses in tension control for selected supervisory employes in Ethyl's New York offices.

The interest in these courses is evidenced by the answers to questionnaires sent to participants at the conclusion of each. Almost without exception, they reported beneficial results. The degree of skill in relaxation which they acquired varied considerably, depending upon natural ability to relax, which varies with individuals, and the amount of practice which each individual devoted to learning the subject.

Some reported that the mere ability to recognize tensions, which they had not realized existed before, was beneficial to them. Others reported ability to sleep more soundly, greater efficiency in their work, and some reported less friction and better relationships with others, both in their business activities and family life.

Many people exert more muscular effort than they need . . . they "try too hard." When they learn to ease up, they produce more effectively . . . and are less tired at the end of the day.

Although this was an abridged training program especially devised for Ethyl Corporation, its simplicity and ease are such that it can readily be extended. Just how far the program will be expanded in Ethyl Corporation is now under study.

Interest Spreading

Meanwhile, Ethyl's experimental program has created an interest in the subject of tension control among other companies. A nationally-known merchandising organization has engaged Dr. Jacobson to train one of its men as an instructor and has instituted its own program. A commercial airline is studying the possibility of giving tension control training to its pilots. Two leading oil companies have asked for fuller information on the subject with the thought of making it available to some of their employes. Inquiries have also been received from a number of other business and industrial firms.

—The End

Rules of Thumb

FOR THE PIPELINER'S NOTEBOOK

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Pipe Line Construction

—16—What is the cost of laying submarine pipe lines into the Gulf?

A quick estimate of the cost of laying offshore pipe lines in 1956 can be made using the following rule:

$$\text{Cost} = \$100{,}000 + c \times \text{length (feet)}$$

The base figure of $100,000 is a reasonable estimate of the cost of moving equipment and men to and from an offshore job.

The factor c varies with the size of pipe:

4, 6, and 8-inch pipe	$5-$6 per foot
10, 12 and 14-inch pipe	$8-$9 per foot
16-inch pipe	$11 per foot
18-inch pipe	$13 per foot
20-inch pipe	$15 per foot

This cost estimate is for laying pipe and the only material costs included are for welding rod.

Example: What is the cost of laying 20 miles of 10-inch pipe offshore in the Gulf?

$$\text{Cost} = \$100{,}000 + \$8\ (5280 \times 20)$$
$$= \$100{,}000 + \$844{,}800$$
$$= \$944{,}800$$

Pipe inspection is necessary following construction and at regular intervals for maintenance. To estimate the cost of diver inspection, multiply the length of line in miles by $550. This figure includes $200 per mile for a team of two divers, the operating cost of boat and crew, plus an engineering report.

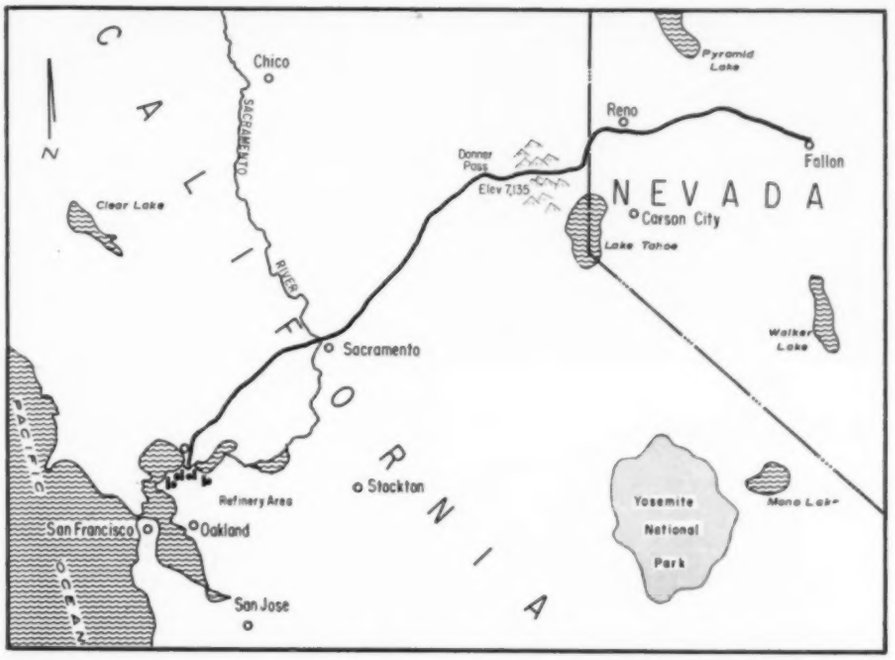
Example: $550 \times 20 = \$11{,}000$ for underwater inspection.

Offshore Oil and Gas Map

A large-scale multi-colored separate insert folded map of the Texas-Louisiana Gulf Coast region accompanies this issue of PIPE LINE INDUSTRY. It covers the offshore area and adjacent inland territory. The map shows such features as oil and gas pipe lines, oil and gas fields, and offshore lease ownership.

WHAT'S HAPPENING

IN PIPE LINE CONSTRUCTION



Proposed route of the second products pipe line to be built by Southern Pacific Pipe Lines Inc. following the railroad right-of-way. Approximately 300 miles long, the line will extend from San Francisco Bay refinery area to Reno and Fallon, Nevada.

Southern Pacific Pipe Lines to Build California-to-Nevada Products Line

Southern Pacific Pipe Lines, Inc. has verified reports that the firm is making plans to lay a products pipe line along its railroad right-of-way between San Francisco Bay area refineries and the Reno and Fallon, Nev. area.

The new products line will be similar to the one completed recently by Southern Pacific between Los Angeles, Phoenix, and El Paso. Preliminary estimates of the new proposal place the cost at about $16 million.

Although pipe sizes, lengths, and exact route have not been announced, it is presumed the line will follow the railroad right-of-way for the greater part of its length. The total distance will be between 250 and 300 miles.

Starting at practically sea level, the line will reach a maximum elevation of 6972 feet at Donner Pass, in crossing the Sierra Nevada Mountains; then will drop to an elevation of about 4500 feet at Reno and 3960 feet at Fallon. The line right-of-way will pass through rough, timbered, mountain territory, including the gold mining country.

Military installations along the right-of-way will be served by the line in addition to communities and other domestic outlets in northern California and Nevada.

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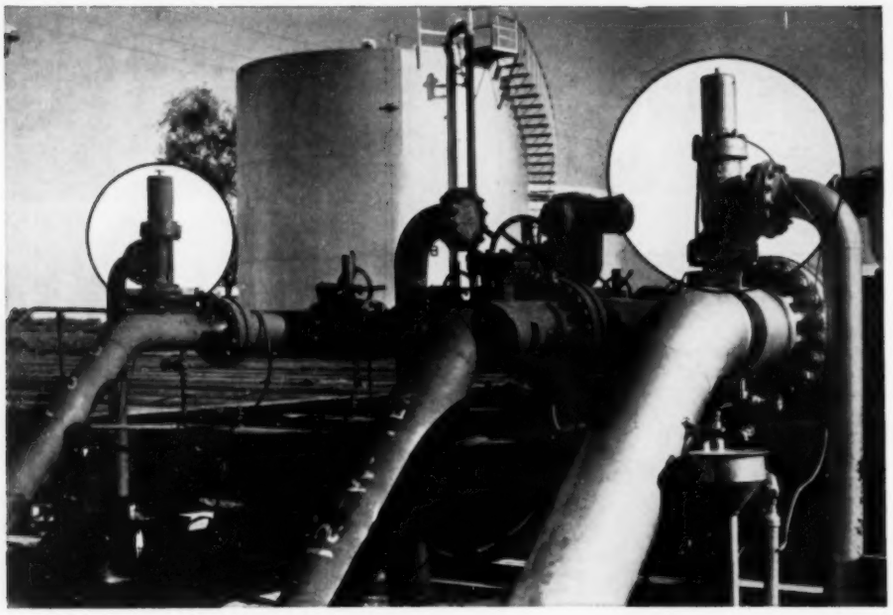

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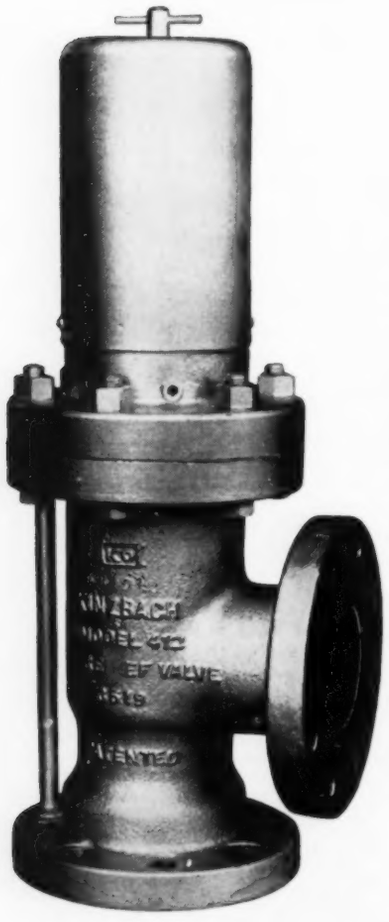

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The Model 412 uses line pressure for opening and closing. The opening pressure is preset by application of a dead weight load. Opening and closing action is positive and reliable. The pre-set pressure never changes.

Kinzbach Model 412 Relief Valves are available in 2", 3", 4", 6" and 8" sizes for working pressures up to 1000 p.s.i. Write for Bulletin RV412 for full technical data.

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FPC Gives Temporary O.K. To Texas Eastern Project

Texas Eastern Transmission Corporation has received temporary authorization from the Federal Power Commission to continue construction and operation of natural gas facilities designed for substitution for the portion of the Little Inch pipe line system which the company had proposed to retire from natural gas service. The temporary authorization does not permit the proposed abandonment of the Little Inch facilities.

Texas Eastern received FPC authorization last June to retire part of the Little Inch system from natural gas service in preparation for its conversion to transporting petroleum products. The firm was authorized to construct new facilities to continue to provide service which was being rendered at the time. Recently the U. S. Court of Appeals for the District of Columbia remanded the case to the Commission for further proceedings. (See PIPE LINE INDUSTRY, March, 1956, page 68.)

Texas Eastern already had begun construction and operation of a portion of facilities authorized by the last year's order and had removed some facilities from the Little Inch line.

The temporary authority to operate the substitute new facilities has been granted to enable Texas Eastern to maintain adequate service to its present customers. The FPC pointed out that its action should not be interpreted as an assurance that a permanent certificate will be issued to Texas Eastern for the construction and operation of the facilities.

Atlantic Gathering System In West Texas in Operation

Atlantic Pipe Line Company's new quarter million dollar crude oil gathering system and pump station in West Texas have gone into operation.

The Crockett County Gathering System, located 14 miles south of Big Lake, Texas, will serve a recently developed oil field of 110 wells which currently produce approximately 3200 barrels per day. Oil will be collected from 30 lease tank batteries and placed in storage for periodic delivery into the company's 384-mile Crane to Refugio, Texas, trunk line.

For more data on advertised products, use Readers' Service Cards, last page.

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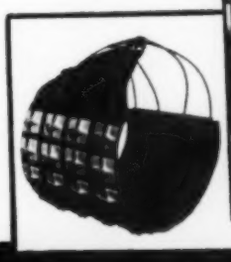
The First COMPLETELY NEW Pipe Sling — Designed, Engineered, and Manufactured to Offer Outstanding Advantages in Greater Performance, Economy, and Safety:

Eliminates need for bail and pins — one-man operation — four times faster than old style slings.

Lower first cost—parts inexpensively replaced.

Stronger than side-boom block and fall line—approximately 100,000 pounds stronger than conventional slings.

Damage to strength member easily detected BEFORE accidents. Will not tear wrapping. Absolutely no stretch.



Standard Stock Sizes

Style	Size	Weight
12	14" Pipe or smaller	30#
18	20" Pipe to 16" Pipe	72#
24	24" Pipe to 22" Pipe	120#
30	30" Pipe to 26" Pipe	146#

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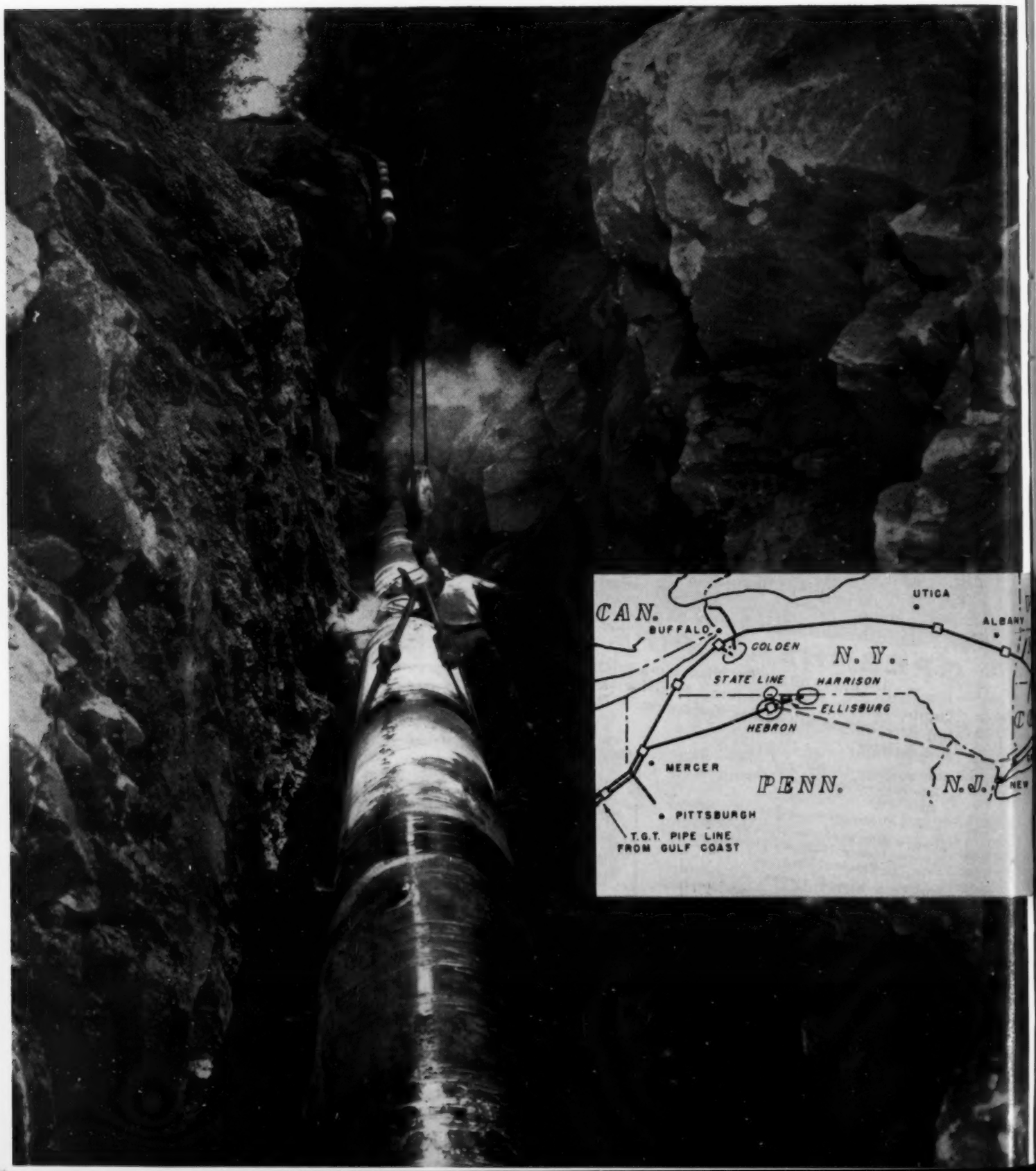
For more data on advertised products, use Readers' Service Cards, last page.

A new look in pipe lines . . .

"THE WORLD'S



FIRST" *installation of*

NATIONAL EXPANDED SEAMLESS LINE PIPE

a 252-mile line from Hebron, Pa., to Greenwich, Conn.

Expanded Seamless Line Pipe is a new product of National Tube—never before used in a pipeline installation. The 252-mile, 24-inch line was installed by Tennessee Gas Transmission Company, from their Hebron underground storage field near Coudersport, Pennsylvania, to Greenwich, Connecticut.

The pipe was apportioned in the following sizes:

205 miles of 24-inch, ⅜-inch wall
46 miles of 24-inch, ½-inch wall
1.5 miles of 24-inch, ⅝-inch wall

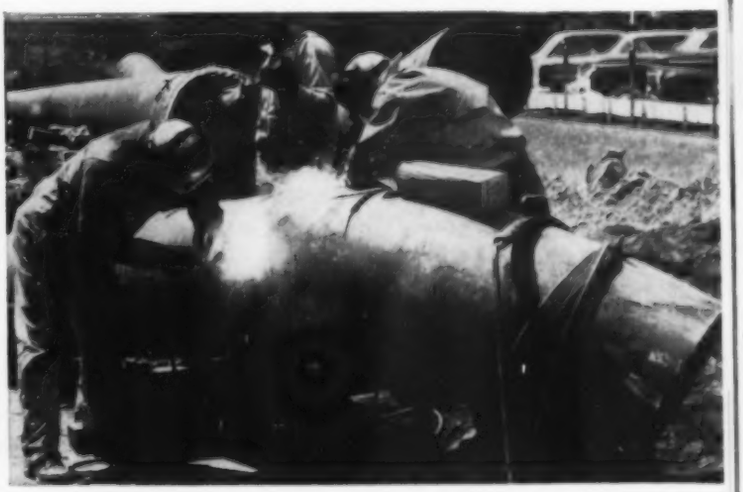
• • •

Not only is National *Expanded Seamless* easier to weld at all temperatures, but it possesses greater, more uniform strength than ordinary line pipe. This high strength permits safer operation at high pressures under all conditions. And the uniform internal size of *Expanded Seamless* facilitates field line-up and welding. It is available in sizes 16-in. to 26-in. O.D., in a full range of wall thicknesses.

On all counts, National *Expanded Seamless* Pipe is absolutely unparalleled for line installations. For improved efficiency and greater economy on *your* next line pipe job, plan to install National *Expanded Seamless* Line Pipe.

IN PIPE LINES TOO . . . SEAMLESS DOES IT BETTER

The pipe laid in the populated areas was yard-coated with coal-tar enamel, glass mat, and asbestos felt. Bending was accomplished by a bending machine at the yard.



Possessing superior welding characteristics, National *Expanded Seamless* in ½-inch wall was welded with five to six beads; in ⅜-inch wall with four beads. The pipe was delivered with a 30° bevel.

NATIONAL TUBE DIVISION, UNITED STATES STEEL CORPORATION, PITTSBURGH, PA.
COLUMBIA-GENEVA STEEL DIVISION, SAN FRANCISCO, PACIFIC COAST DISTRIBUTORS
UNITED STATES STEEL EXPORT COMPANY, NEW YORK

NATIONAL SEAMLESS PIPE AND TUBES

WALLS WITHOUT WELDS

UNITED STATES STEEL

New York State Natural To Build 27-Mile Extension

New York State Natural Gas Corporation has received temporary authority from the Federal Power Commission to construct a 27-mile extension of pipe line to connect with a new natural gas field in Pennsylvania.

The line, which is estimated to cost $1.5 million, extends from an existing line in Elk County, Penn., to the new Luthersburg gas field in Clearfield, Jefferson and Indiana Counties, Penn.

Colorado Interstate Plans 800-Mile Line

Colorado Interstate Gas Company has applied to the Federal Power Commission for authorization for a $76 million construction program in 1957 including 800 miles of natural gas pipe lines and compressor stations to bring gas from the Texas Panhandle and northern Colorado to Beatrice, Neb.

Colorado Interstate proposes to increase its daily delivery capacity of natural gas by 350 million cubic feet, which will be delivered to Natural Gas Pipeline Company of America for transmission into Chicago and the Midwest. (See PIPE LINE INDUSTRY, March, 1956, page 60.)

Proposed new transmission lines include 307 miles of 30-inch main line from Idalia in northeastern Colorado to Beatrice, Neb. Gas will be fed into this main line from western and southern supply sources through two new 26-inch lines.

The 26-inch line feeding gas from western supply sources will run 160 miles from a point south of Cheyenne, Wyo., near Carr, Colo. to Idalia. This line will be a take-off from Colorado Interstate's new transmission line between Green River, Wyo., and Denver. One section of the Green River-Denver line is completed and the remainder scheduled for completion this year. The 26-inch line feeding gas from southern supply sources will extend 75 miles from the company's present compressor station near Kit Carson, Colo., to Idalia.

To bring additional gas from Colorado Interstate's supply areas in Texas, Oklahoma and Kansas to Kit Carson, 215 miles of 24-inch and 20-inch loop line will be built from Kit Carson to Fourway compressor station in the West Panhandle field of Texas. Additional gas will be provided from the Greenwood, Sparks and Taloga fields in Kansas and from the Keyes and Eva fields in Oklahoma through 34 miles of new 16-inch lateral supply line.

A total of 35,500 additional horsepower will be installed in six new compressor stations, and 17,800 new horsepower will be installed in four existing compressor stations.

The Beatrice project is part of a two-year expansion program by Colorado Interstate estimated to cost $116 million. The completion of these facilities will expand Colorado Interstate's pipe line system to more than 3700 miles of transmission, sales and gathering lines with a total of 160,000 installed horsepower.

E. R. P. CATHODIC PROTECTION ...
INDIVIDUALLY DESIGNED FOR EACH APPLICATION

An effective installation that operates at the lowest cost per year requires experienced engineering evaluation of site and environmental conditions. The Electro Rust-Proofing Engineering Division makes available to you the cumulative experience gained in designing more than 10,000 cathodic protection systems.

Electro Rust-Proofing can furnish any one, or all, of the following services to help you provide proper cathodic protection for each of your jobs:

- Corrosion surveys and recommendations
- Design based on engineering experience
- Cathodic protection equipment and installation
- Service to assure proper operating results

For additional information write today.

ERP CATHODIC PROTECTION SINCE 1935

ELECTRO RUST-PROOFING CORPORATION
30 MAIN STREET, BELLEVILLE 9, N. J.

E-35

Ask your local gas utility to demonstrate the greater economy, comfort and space-saving convenience of heating your home with natural gas.

makes summer of winter

Why are fifteen million homes now heated with natural gas . . . and another million being added each year?

It's the clean, healthful, even heat gas provides. It's also the economy and comfort of automatic heating at its best. The simplicity and low cost of the installation. The elimination of delivery and storage problems. The assurance of unfailing supply . . . for gas traveling underground is never stopped by weather or traffic.

Small wonder that 8 of every 10 new homes heat with natural gas wherever it is available. And Tennessee Gas, hauling it economically by pipeline is making more and more of it available.

TENNESSEE GAS

TRANSMISSION COMPANY

AMERICA'S LEADING TRANSPORTER OF NATURAL GAS

HOUSTON, TEXAS

One of a series of advertisements appearing in full color in national publications.

So Rapid and Dramatic has been the progress of natural gas, consumers are not always aware of the latest developments.

TGT advertising is designed to keep the public informed. By telling millions of the convenience, cleanliness, availability of this great natural fuel, ads like this broaden the market . . . create greater goodwill for the whole industry.

TENNESSEE GAS TRANSMISSION COMPANY
HOUSTON, TEXAS

Sinclair Completes Portion of 'Big Inch'

Construction of the northern section of Sinclair Pipe Line Company's Texas "Big Inch" crude oil line has been completed, replacing several small diameter lines. The line, from Jacksboro to Teague, Texas, is 152 miles.

River Construction Corporation was contractor. The second portion of the line, from Teague to Houston, will be constructed soon.

PG&E Plans Underground Storage Project

Pacific Gas and Electric Company has announced plans for the conversion of a gas field in Yolo County, Calif., into the company's first natural underground storage area.

Estimated to have a usable capacity of 3.25 billion cubic feet, the Pleasant Creek field northwest of Winters is being planned as a storage area where natural gas obtained by Pacific Gas and Electric during periods of low demand can be stored for use when needed.

The company plans to build a 2640-horsepower compressor station on the site and to lay pipe in a gathering system to connect each of the three existing wells, plus new wells to be drilled, to the station. The compressor plant will be capable of injecting gas obtained from its general system at a rate of about 36 million cubic feet a day. It is expected that the project will be capable of delivering gas from storage into the system at a maximum rate of 80 million cubic feet a day.

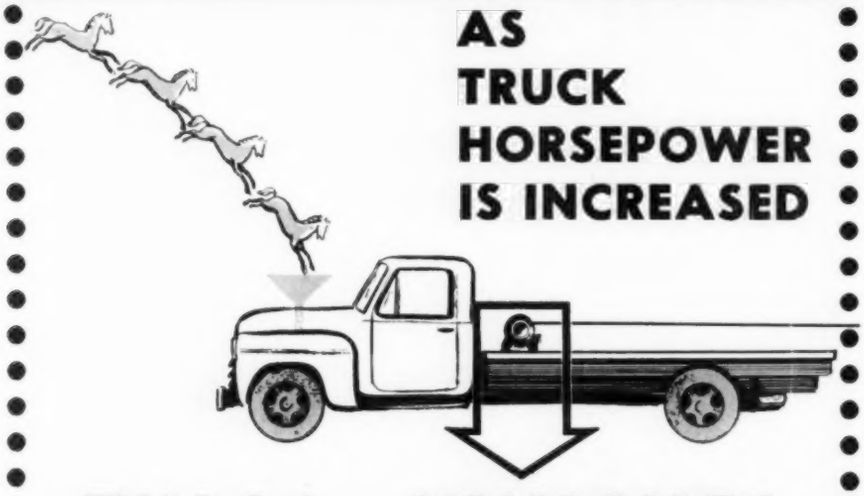
A line of 16-inch diameter is planned to connect the field with the Pacific Gas and Electric's main transmission system near Dixon. At present, the Pleasant Creek gas is delivered into the system through a 4-inch line. The entire project, including rights on about 2200 acres, is estimated to cost $3.3 million.

Pennsylvania Gas Company Plans 38-mile Gas Line

Pennsylvania Gas Company has requested authority from the FPC to construct two natural gas pipe lines, totaling 38 miles, in Erie and Warren Counties, Penn., and Chautauqua County, N. Y.

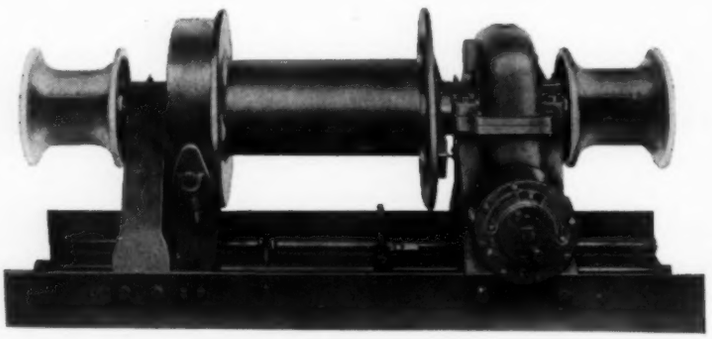
Estimated to cost $930,000, the project will include 23 miles of 10-inch line in Erie County and 15 miles of 8-inch line in Warren and Chautauqua counties.

AS TRUCK HORSEPOWER IS INCREASED



TULSA® WINCHES

ARE STRENGTHENED AND IMPROVED TO TAKE ADVANTAGE OF THIS AVAILABLE POWER



Over 28 models to choose from with capacities from 6,000 to 100,000 pounds . . . breaking point is OVER TWICE the rated capacity. See your nearest TULSA WINCH distributor for complete details.

Tulsa Winch
TULSA, OKLAHOMA DIVISION OF VICKERS Inc.

Use the Readers' Service Cards

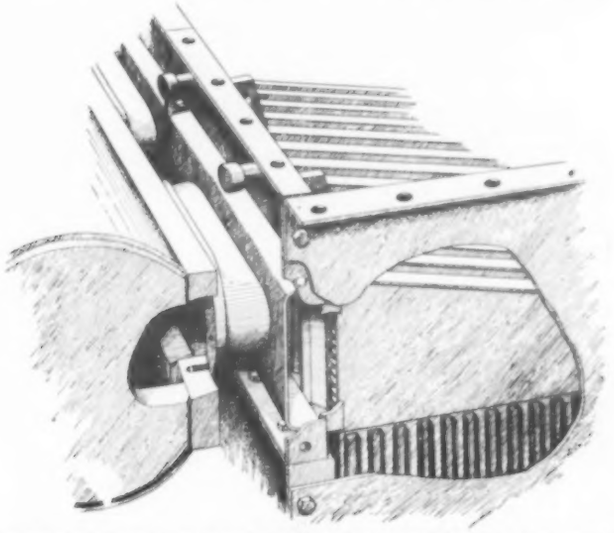
For more information on New Equipment described in this issue, for copies of the literature reviewed, and for data on any advertised products, use the Readers' Service Cards on the last page, just inside the back cover. Circle on the card the editorial or advertising code numbers of the items desired. Sign and mail the card. Your requests will be forwarded to the manufacturer and the information will be mailed directly to you.

how

a

PIN-FIN

extended-surface regenerator



Detail sketch showing specially designed 'pin-like' shapes which greatly increase heat-transfer surface area.

adds to economy of gas-turbine operation . . .

Compact, light-weight PIN-FIN Regenerator unit.

REDUCED FUEL CONSUMPTION is a principal reason. For example, a 75%-effective Air Preheater PIN-FIN Regenerator in a gas-turbine cycle at 6 to 1 pressure ratio and a turbine inlet of 1500 F, will cut fuel consumption by about 32%.
And, just as important, is the fact that these regenerators need practically no maintenance. That's been proved by five years of actual field service. Get the complete story of what a PIN-FIN Regenerator can do for you – call or write the Air Preheater Corporation.

Mechanical Advantages of Air Preheater's PIN-FIN Regenerator...

- Compact
- Light-weight
- Quickly erected
- Minimum maintenance
- Convenient, one-unit design
- Easily disassembled

Air Preheater Corporation 60 East 42nd Street, New York 17, N. Y.

SUBMARINE PIPELINES

around the world

COLLINS CONSTRUCTION COMPANY

PORT LAVACA, TEXAS

P. O. Box 256 Cable Address Collinstex Portlavaca (Texas) JAckson 4-3771

NATO Awards Contracts For Two Turkish Pipe Lines

Construction is underway on two more products pipe lines to serve military airfields in the interior of Turkey. Contracts were awarded by the North Atlantic Treaty Organization to an Italian firm, Cia. Tecnica Internazionale (Techint) of Milan.

Both lines terminate at Eskisehir, 140 miles west of Ankara in central Turkey. The Bandirma to Eskisehir 4-inch line, 205 miles long, will cost $1.4 million. The 8-inch Antalya-Eskisehir section will be 250 miles long.

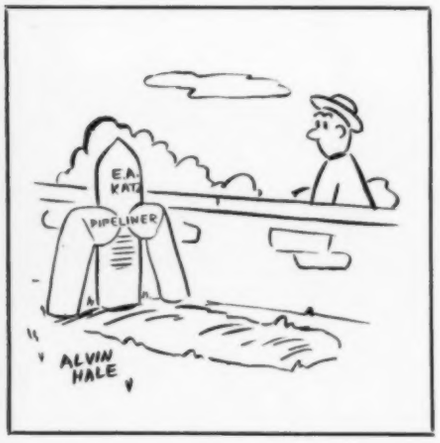
Associated Pipe Line Contractors, Inc. is laying 425 miles of 4, 6, and 8-inch pipe on the NATO sponsored products line from Iskenderun in southern Turkey to Batman.

Contracts are still to be awarded for building 22 pump stations and 14 terminals on the pipe lines.

Canadian Firm Plans 58-Mile Gathering System

South Saskatchewan Pipe Line Company has applied to the Minister, Department of Mineral Resources, Province of Saskatchewan, for permission to construct a 58-mile 12-inch main line gathering system from the present facilities in the Cantuar field south and slightly west to the Dollard field.

Estimated to cost $3 million, this extension will extend through the North Premier, Midway, Gull Lake, Bone Creek and Dollard fields. The firm plans to begin construction in July, pending approval of the application, and to complete the project by September. This project is an addition to the present system which extends from the Cantuar field to Regina.



In Pipeline Service...

MAKE SURE YOUR SMALL PIPING IS JOINED SAFELY, TOO

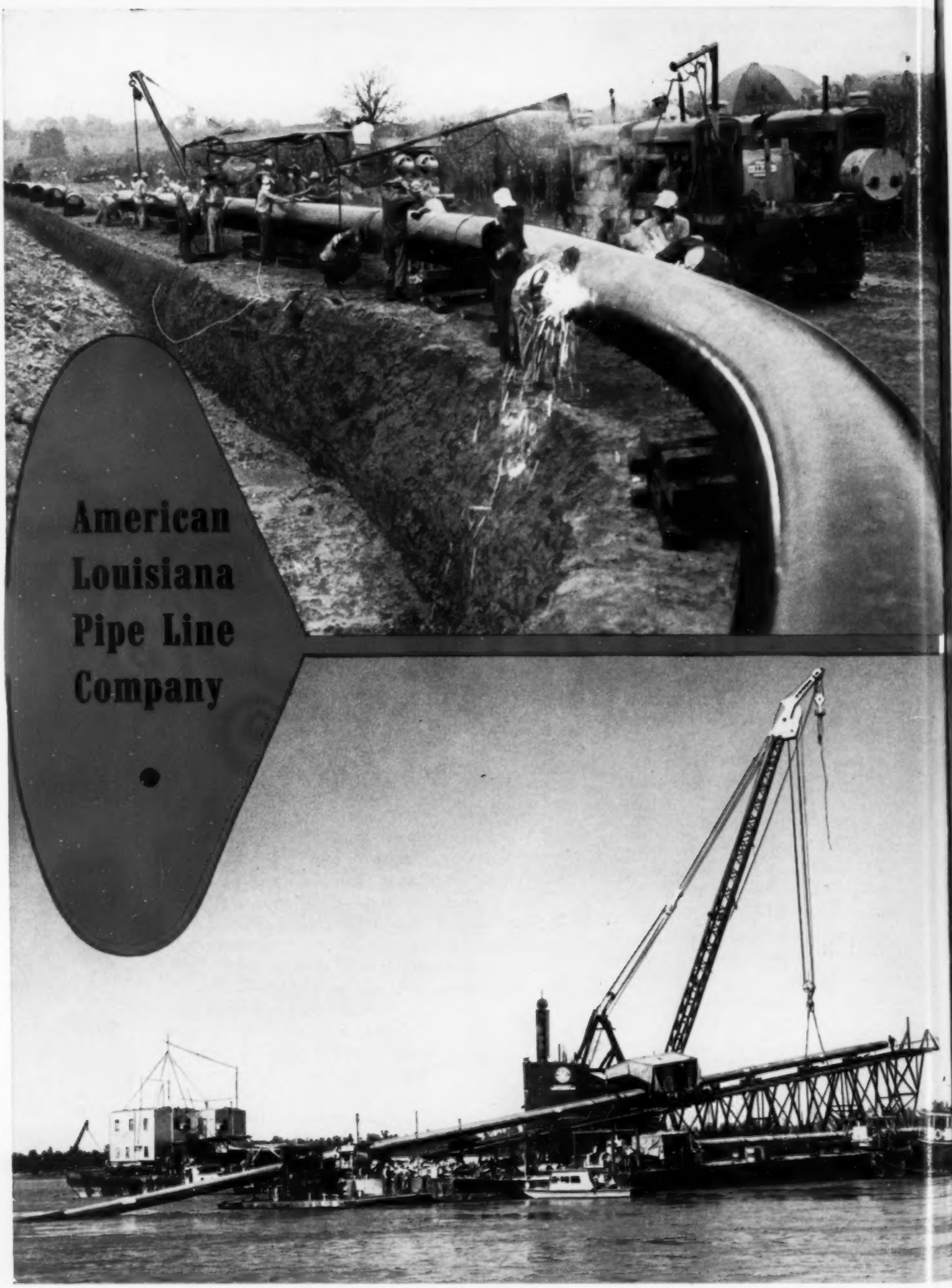
■ W-S Forged Steel Fittings provide safe, tight connections for your small diameter, high pressure piping. In gathering lines . . . pump and compressor piping . . . instrument lines and other high pressure lines, 4" and under in diameter, W-S fittings protect you against costly down-time. They're drop-forged for extra strength and toughness—and they're safety-factor designed.

Watson-Stillman Fittings are available in screw-end and socket-welding types in carbon steel, stainless steels and alloy steels. Send for your copies of our informative catalogs.

W-S FITTINGS DIVISION

H. K. PORTER COMPANY, INC.
Roselle, New Jersey

For more data on advertised products, use Readers' Service Cards, last page.


American
Louisiana
Pipe Line
Company

Starting at Tepetate, Louisiana, the line travels across the Red River southeast of Alexandria, La. . . . passes through the southeast corner of Arkansas . . . across the Mississippi near Greenville, Miss., the Kentucky Lake Reservoir of the Tennessee and Cumberland Rivers . . . runs northward across the Green and Ohio Rivers in Kentucky . . . and north through Indiana, Ohio into Michigan. A lateral to the Michigan Wisconsin Pipe Line will start at Payne, Ohio.
Michigan Wisconsin Pipe Line
IOWA
ILLINOIS
INDIANA
OHIO
DETROIT
PENN
PAYNE
300,000,000
cu. ft. per day
TENNESSEE
ALABAMA
GEORGIA
SOUTH CAR
LOUISIANA
MISSISSIPPI
FLORIDA
TEPETATE
ABOUT THE PICTURES: Top photo shows welding and stringing of 30" pipe near Chrisney, Ind. Lower photo shows some of more than $6,000,000 worth of equipment used on Mississippi crossing. A. O. Smith 24" pipe with 1/2" wall thickness has been triple-jointed, heavy-coated and then weight-coated with concrete to withstand the unpredictable currents and the ravages of underwater existence.
A. O. Smith pipe is available in a complete range of sizes and wall thicknesses from 8 5/8 to 30" diameter.

793 Miles of A. O. Smith Line Pipe

THE new American Louisiana Pipe Line is being built to meet the tremendous requirements for additional supplies of natural gas in Michigan, Wisconsin and parts of Iowa and Missouri. When complete it will bring 300,000,000 cu ft of gas per day to these states. This capacity can be increased to 550,000,000 feet per day by the addition of compressor horsepower.

The main line will be 30" in diameter and extend 1000 miles from southern Louisiana to a connection with Michigan Consolidated Gas Company at Willow Run. It will cross 8 states and nine major rivers and lakes, marshes, swamps, rice fields, forests and the mountains of Tennessee, Kentucky and southern Indiana. Also, approximately 78 miles of 24" and 26" main line will be laid in southern Louisiana.

The pipe line system was designed by Ford, Bacon & Davis, Inc., and construction is being done by H. C. Price Company, Houston Construction Company and Brown & Root, Inc.

A. O. Smith Corporation played an important part in this new line by furnishing 758 miles, over 75%, of the 30" pipe from its Houston Mill, A. O. Smith Co. of Texas, and 35 miles of the 26" pipe, together with the 24" heavy wall pipe used for the major river crossings, from its Milwaukee Mill.

For almost 30 years A. O. Smith has held a high-standard of quality control and this quality control has been maintained at every step of the manufacturing process. That's why A. O. Smith pipe made and installed in 1928 is still in operation. That's why so much A. O. Smith pipe has been used in nearly every important high pressure line.

Through research ... *a better way*

A. O. Smith
CORPORATION

TUBULAR PRODUCTS DIVISION
Milwaukee 1, Wisconsin

Chicago 4 • Dallas 2 • Los Angeles 22 • Midland 5, Texas • New Orleans 12 • New York 17 • Pittsburgh 19 • San Francisco 4 Seattle 1 • Tulsa 3 • Washington 6, D. C.
International Division: Milwaukee 1, Wisconsin

For more data on advertised products, use Readers' Service Cards, last page.

Home Oil Company to Build Crude Line to Calgary

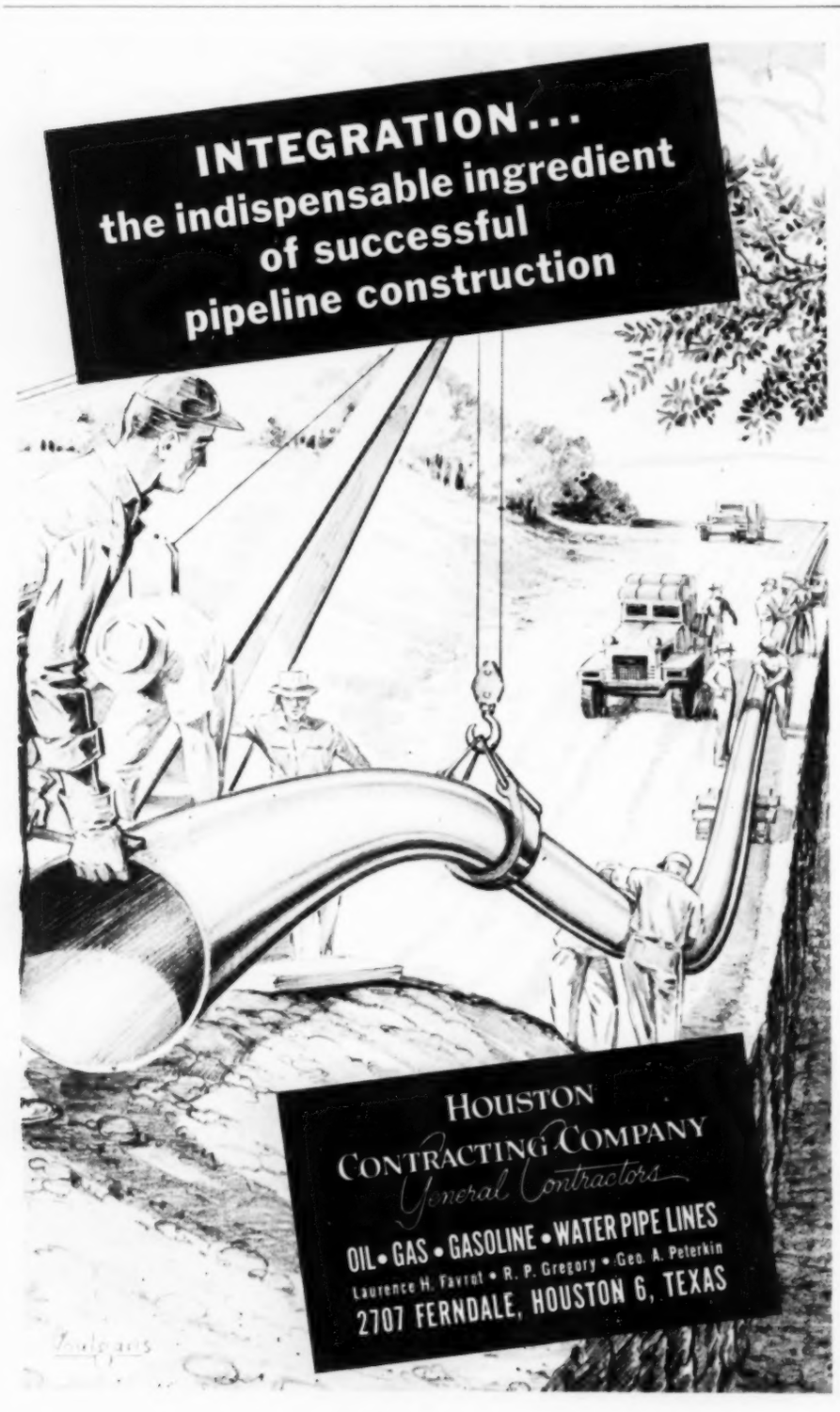
Home Oil Company Ltd. has been awarded a permit to construct a crude oil pipe line to Calgary from the Sundre-Westward Ho-Harmattan oil fields 60 miles to the northwest.

Home Oil's wholly-owned subsidiary, Cremona Pipe Lines Ltd., will build and operate the 8-inch line with initial capacity of 18,000 barrels daily. It is expected to be in operation this year.

Atlantic Seaboard Receives Permit for 86-Mile Line

The Federal Power Commission has authorized Atlantic Seaboard Corporation to construct $8.5 million in new pipe line facilities in West Virginia and Virginia.

Seaboard will build a total of 86 miles of pipe line, 31 miles paralleling sections of the company's existing 26-inch line in West Virginia and Virginia and 55 miles from the Lost River compressor station, Hardy County, W. Va., to Bickers compressor station, Greene County, Va. interconnecting the company's 26-inch and 20-inch lines.



Permian Basin Gas Line In Texas Authorized

Permian Basin Pipeline Company has received Federal Power Commission authorization to construct a 19-mile 16-inch natural gas pipe line in Andrews County, Texas, to transport an additional 25 million cubic feet of gas per day into the company's system.

In addition Permian will build a 6750 horsepower compressor station to receive and transport the gas, which will be purchased from Phillips Petroleum Company. Permian's project is estimated to cost $2.8 million. The FPC also gave authorization to Phillips to sell the gas to the pipe line company.

Gulf Enters Agreement For Bolivian Pipe Line

Gulf Oil Corporation has entered into an oil development and pipe line agreement with the Bolivian government. Three Tulsa firms, Falcon Seaboard Drilling Company, Barry & Reiner Inc. and Williams Brothers, have a 20 percent interest in the Gulf subsidiary, Bolivian Gulf Oil Company, which will handle Gulf's part of the agreement.

Included in the deal, which involves exploration rights on a 3.7 million acre concession, is a plan for Bolivian Gulf to provide $5 million in financing a 200-mile crude line to be constructed by Williams Brothers. The line will extend from Sicasica, Bolivia, to Arica on the Chilean seacoast, to give Bolivia an export outlet. A $35 million pipe line to transport crude from southeastern fields to Sicasica is considered if future production should prove that the line is needed.

200-Mile Pakistan Gas Line To Be Built from Sui Field

Construction is expected to begin by September on a 200-mile 16-inch pipe line for Sui Gas Transmission Company to deliver natural gas from the Sui field in Pakistan northward to Multan in southern Punjab where a new power plant is being built.

The project will be built by Pakistan Development Corporation.

Here's the pitch on dependable WELDING FITTINGS

Welding fittings from J&L Supply are guaranteed accurate within ASA tolerances. Cut your pipe with confidence!

- Store stocks for your pick-up requirements.
- More comprehensive stocks centrally located and promptly available.
- On special specifications, direct factory shipment from the most versatile plants in America — welding fittings engineered to enable you to improve piping designs and reduce costs.

The line includes fittings of easy-to-weld JALTEN, made by J&L. Ideal for use with high-tensile, high-yield pipe.

Jones & Laughlin

SUPPLY DIVISION – Tulsa

SERVING THE UNITED STATES AND CANADA

7-G

For more data on advertised products, use Readers' Service Cards, last page.

Peace River Crude Line Completed in Canada

Peace River Oil Pipe Line Company has completed a 106-mile crude oil pipe line between the Sturgeon Lake producing region in northwestern Alberta, Canada, to the Edson station of the Trans Mountain pipe line.

In addition there are 50 miles of gathering system and total cost of the project is $7.5 million. Production from Sturgeon Lake has been moved by truck and rail to pipe line facilities at Edmonton.

The Peace River line was sponsored by a group of oil producing companies operating in the Sturgeon Lake area, including Amerada Petroleum Corporation, Western Leaseholds Ltd., Hudson's Bay Oil and Gas Company, Imperial Oil Limited, Liberal Petroleums Ltd., Shell Oil Company, Texaco Exploration Company, Union Oil Company of California and Canadian Gulf Oil Company.

Suntide's 40-Mile Crude Line In Operation in South Texas

Suntide Pipe Line Company has completed 40 miles of 8-inch pipe line from Refugio to Pettus, Texas. The line went into operation in April with a daily capacity of 25,000 barrels of crude oil.

The additional line enables Suntide to buy crude in the area for transportation to the Corpus Christi refinery.

Proposed Pipe Line Construction

COMPANY	Length in Miles	Diameter	Type	Origin and Terminus	Estimated Cost	Status
Alberta Gas Trunk Line, Ltd.	547	6-34	Gas	From Alberta fields to western terminus of Trans Canada Pipe Line, Ltd.	$47 million	Approved
American Gilsonite Co.	80		Gilsonite Slurry	Bonanza, Utah—Western Colorado, refinery	.....	Considered
American Pipe Line Corp.—New York City (Swinerton & Walberg, Engineering)	1,425	24, 26	Products	Beaumont, Texas area—Newark, N.J., plus 485 miles of laterals.	$170 million	Approved ODM
Arkansas-Louisiana Gas Co.	66	24	Gas	Arkansas, Louisiana and Texas loops	$9,245,166	Authorized
Atlantic Seaboard Corporation	86	20, 26	Gas	In West Va. and Va. paralleling sections of the company's existing line and extending from Seabcard's Lost River compressor station to its Bickers compressor station interconnecting the company's lines.	$8.5 million	Authorized
California-Oregon Pipe Line System	100	6	Crude	Crescent City, Calif.—Medford, Ore.	$2 million	Planned
Central Kentucky Natural Gas Co.	24	20, 24	Gas	Cold Springs—Anderson Ferry, Ky.	$2.5 million	Authorized
Chaco Pipeline & Refinery Corp.	450	....	Products	From Glenn McCarthy's Bolivian wells to new refinery at Conception, Paraguay	.....	Planned
Cities Service Gas Co.	15.5	16	Gas	Various locations in Kansas and Oklahoma	.....	Planned
Coastal Transmission Corp.—Houston, Texas	565	20-26	Gas	McAllen, Texas—Louisiana connection, Houston, Texas Gas, plus 272 miles of laterals	$68 million	Before FPC
Colorado Interstate Gas Co.	380	22	Gas	Green River, Wyo.—Denver	.....	Authorized
	800	16-30	Gas	Idalia, Col. to Beatrice, Neb. to deliver gas from Rocky Mountain area and Texas and Oklahoma Panhandle fields to Natural Gas Pipe Line Co. of America	$76 million	Before FPC
	500	....	Gas	Laramie, Wyo. to Beatrice, Neb.	$68 million	Planned
Compania Shell de Venezuela	177	20	Gas	La Paz field to Cardon refinery on Paraguana peninsula	$20 million	Planned
Consolidated Gathering Systems, Ltd.	198	....	Crude	Sturgeon Field—Edmonton.	.....	Planned
Consolidated Natural Gas Corp.—New York	112	....	Gas	In Ohio—Plus other smaller lines	$6 million	Planned
Deep Rock Gas Co.	120	6	LPG	Tioga, N.D.—Canadian border	.....	Planned
El Paso Natural Gas Co.—El Paso, Tex.	414	34	Gas	Parallel from San Juan Basin to Topock, Ariz.	$194 million	Authorized
El Paso Natural Gas Products Co.	240	8	Products	Midkiff natural gasoline plant in Permian Basin to El Paso	.....	Planned
Houston Texas Gas & Oil Co.,—4604 Main St., Houston	961	12-30	Gas	Baton Rouge, La. to Miami, Fla. plus 496 miles of laterals and compressor facilities	$105 million	Before FPC
Hydro-Carbons Pipe Line, Ltd.	800	....	LPG	Edmonton to Winnipeg with gathering system and storage	$35 million	Planned
Imperial Oil, Ltd.	38	12	Products	Parallel existing line from Waterdown, Ont., to North Toronto terminal	$1.7 million	Planned
Iron Ranges Natural Gas Co.	115	....	Gas	From Itasca and St. Louis Counties along route of Mesabi range from Grand Rapids to Aurora, Minn.	$5 million	Before FPC
Magna Pipeline Company	40	....	Gas	Underwater line from Anacortes, Wash. to Victoria, B.C.	$6 million	Planned
Malco Pipe Line Inc.	91	6	Products	Prewitt, N.M.—Albuquerque	$1,250,000	Considered
Michigan-Wisconsin Pipe Line Co.—500 Griswold, Detroit	472	4-24	Gas	Main line loops and extensions in Wisconsin, Illinois and Michigan	$17.6 million	Before FPC
Midwestern Gas Transmission Co., Houston, Texas	1112	....	Gas	Emerson, Manitoba—Nashville, Tenn.	$98 million	Before FPC
Montana-Dakota Utilities Co —Minneapolis	44	....	Gas	Various locations in S.D. and Wyoming	$1.4 million	Authorized
	41.8	12	Gas	Williams County, N.D.	$1.4 million	Authorized
NATO	1920	4-10	Products	To serve military bases in Western Europe	.....	Foster-Wheeler Prime Contractors, 1330 miles let
Natural Gas Pipe Line Co. of America—20 N. Wacker Dr., Chicago	350	20, 26	Gas	Wise County, Texas—Fritch, Texas	$28.5 million	Authorized
	480	30, 36	Gas	Loops at various points along existing line	$80 million	Before FPC
New York State Natural Gas Corp.	27	....	Gas	Elk County, Penn. to Luthersburg gas field in Clearfield, Jefferson and Indiana Counties, Penn.	$1.5 million	Authorized
North Carolina Natural Gas Corp.	575	3-16	Gas	Mooresville eastwardly across North Carolina	$13 million	Authorized
Northern Natural Gas Co.—2223 Dodge St., Omaha	167	24	Gas	Farmington, Minn. to Duluth, Minn. and Superior, Wis.	$12 million	Before FPC
	....	....	Gas	To interconnect with Natural Gas Pipe Line	$244,000	Planned
	28.4	30	Gas	Test lines to underground storage near Redfield, Iowa	$4.8 million	Before FPC
Offshore Gathering Corp., Houston	364	24, 26, 30	Gas, Crude	Texas side of Sabine River 25 miles offshore La. to Mississippi side of Pearl River	$150 million	Before FPC
Pacific Gas & Electric Co.	150	34	Gas	Various loops, between Topock, Ariz.—Milpitas, Calif.	$4 million	Planned
	83	12, 18, 20	Gas	Glenn County areas to Sarcamento region	$5 million	Planned
Pacific Northwest Pipe Line Corp.—M & M Bldg., Houston	1,487	22, 26	Gas	San Juan Basin—Pacific Northwestern states and Canadian border terminus near Sumas, Wash. plus 732 miles of supply and sales laterals	$246 million	Contracts let for main line and 477 miles of laterals
Pakistan Development Corp.	210	16	Gas	Sui gas field, West Pakistan, to Multan	.....	Planned
Pembina Pipe Line, Ltd.	100	....	Crude	Gathering line and new pumping unit in West-Central Alberta	$4.5 million	Planned
Pennsylvania Gas Co.	38	8, 10	Gas	In Erie and Warren Counties, Penn., and Chautauqua County, N.Y.	$930,000	Before FPC
Permian Basin Pipe Line Co.	19	16	.....	Facilities in Andrews County, Texas	$2.8 million	Authorized
Petroargentina	370	16	Crude	Newguen—Bahia Blanca, Argentina	$40 million	Planned
Petroleos Mexicanos—Ave. Juares, 94, Mexico City	440	20	Gas	Brazil—Tampico—Poza Rica, Mexico	.....	Planned
	145	12	Crude	18 de Marzo Field—Monterrey, Mexico	.....	Considered
	80	8	Products	Guaymas—Los Mochis	$1 million	Planned
Phillips Petroleum Co.—Bartlesville	54	6	Products	Goldsmith—Borger, Texas	.....	Planned
	60	12	Ethylene	Sweeny—Pasadena, Texas	.....	Contract let
	22	20	Gas	Roberts County, Texas, to Rock Creek gasoline plant	.....	Approved

(Continued on page 76)

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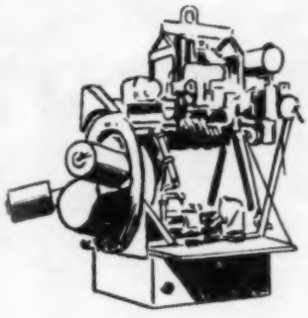

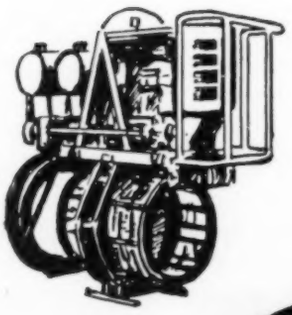

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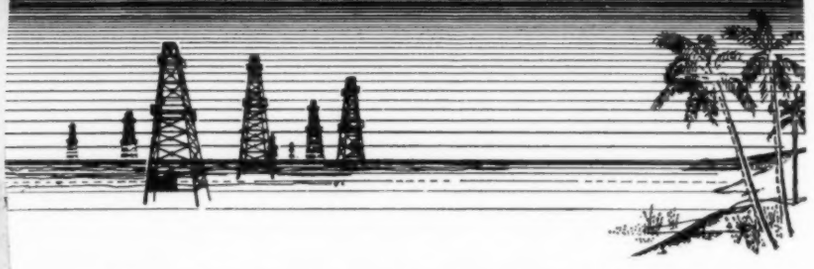
Proposed Pipe Line Construction—(Continued)

COMPANY	Length in Miles	Diameter	Type	Origin and Terminus	Estimated Cost	Status
Sinclair Oil Corp.	240	....	Crude	San Silvestre field, Barinas, Venezuela, to Puerto Cabello on Caribbean sea coast	$25 million	Planned
South Alberta Pipe Line, Ltd.	46	10	Gas	Etzikom Field—Medicine Hat, Alberta	$1 million	Planned
South Saskatchewan Pipe Line Company	58	12	Crude	Cantuar field to Dollard field, Saskatchewan	$3 million	Planned
Southern Calif. Gas Co. and Southern Counties Gas Co.	278	30	Gas	Topock, Ariz.—Newhall, Calif.	$31 million	Planned
Southern Natural Gas Company	52	....	Gas	Various locations in Ga. and La.	$2.2 million	Authorized
Southern Pacific Pipe Lines, Inc.	....	....	Products	From San Francisco Bay area to Reno—Fallon, Nev. area	$16 million	Planned
Stanmount Pipe Line Co.	140	10	Crude	Cayiga and Beaver Lake Fields, N.D. to connect with Interprovincial Pipe Line	.....	Planned
Sturgeon Pipe Line Ltd.	100	12	.....	Sturgeon Lake Field—Trans-Mountain system	$6,500,000	Planned
Sunflower Pipe Line Co.—Tulsa, Okla.	265	3-6	LPG	Kearny, Grant and Haskel Counties, Kansas—Wichita, Kansas	$3.5 million	Authorized
Tecumseh Pipeline Co.	....	20	Crude	To connect to principal crude line carriers in Chicago area for movement to east	.....	Planned
Tennessee Gas Transmission Co.—Box 2511, Houston.. (See also Midwestern Gas Transmission Co.)	220	26, 30	Gas	Loops in Kentucky and Ohio plus 376 miles of Supply laterals in Texas and Louisiana	$56 million	Authorized
	100	....	Gas	Gathering lines in Texas and Louisiana plus station additions	$18.6 million	Before FPC
	162	....	Gas	Loop Lines in Kentucky, Ohio, and Pennsylvania	$24.3 million	Before FPC
	200	....	LPG	Banquette, Texas, natural gasoline plant to Houston	.....	Planned
Texas Eastern Transmission Corp.	422	30	Gas	McAllen to Vidor, Texas	Estimated	Before FPC
	530	30	Gas	Loops at various points between Kosciusko, Miss. and Uniontown, Penn.	Cost of Entire Project	Before FPC
	45	24	Gas	Provident City, Texas crossover to McAllen-Vidor line	$150	Before FPC
	135			Supply and delivery lines laterals	Million	Before FPC
Texas Eastern Transmission Corp. and Texas Eastern Penn-Jersey Corp.	....	....	Gas	Additional compressor facilities to system in Penn.	$8.3 million	Before FPC
Texas Gas Transmission Corp.	198	20	Gas	East Lake Palourde Gas field, La. to Eunice, La. and loops paralleling existing system in Arkansas, Mississippi, Tennessee, Kentucky, Indiana	$20 million	Authorized
	40	....	Gas	Parallel lines at various locations in Louisiana, Arkansas, Mississippi, Kentucky, Illinois	$20 million	Before FPC
Trans-Canada Pipe Line, Ltd.—Calgary, Alberta	2240	30, 36	Gas	Alberta—Eastern Canada	$297 million	Planned
Trans Carolina Pipeline Co.	280	....	Gas	In tidewater areas of North and South Carolina	$21.6 million	Before FPC
Transcontinental Gas Pipe Line Corp.—3100 Travis St., Houston	....	....	Gas	Connecting facilities with Texas Eastern Penn-Jersey in Pennsylvania and New Jersey	$131,628	Authorized
	24.2	....	Gas	Gathering Lines from South Bayou Mallet, Maxie and Happytown Fields, La.	$754,000	Authorized
	12	....	Gas	Live Oak gas field, Vermillion Parish, La. plus two meter stations	$707,000	Before FPC
	228	30, 36	Gas	In Louisiana, Mississippi, Alabama, Georgia, S. Carolina, N. Carolina, Virginia, Maryland, Pennsylvania	$38.5 million	Before FPC
United Natural Gas Co.	50	12	Gas	Elk County—Jefferson County, Pa.	.....	Planned
U. S. Navy	450	8	Gas	Gubik Field—Fairbanks, Alaska	$20 million	Planned
Washington Gas Light Co.	11	24	Gas	Chillum Station—Gordon's Corner, Md.	$2 million	Authorized
Westcoast Transmission Company, Ltd.	270	8-26	Gas	Various locations in Peace River region	.....	Planned
Wilcox Trend Gathering System, Inc.	16	16	Gas	Gathering lines to Provident City, Texas	$2.9 million	Before FPC
Winnipeg and Central Gas Co.	450	4-8	LPG	Tioga, N.D.—Winnipeg, Canada	$20 million	Planned

16/60 Model Trencher digging in hard sand

in the MIDDLE EAST

PIPE LINE TRENCHING



Engineers in oil-producing countries know the best machines for the job. For trenching, they specify ALLEN—a name renowned for reliability, freedom from costly breakdowns, and ease of maintenance. In hot, dusty conditions, ALLEN trenchers slog on, day in, day out, standing up to years of continuous hard work—they have no equal anywhere.

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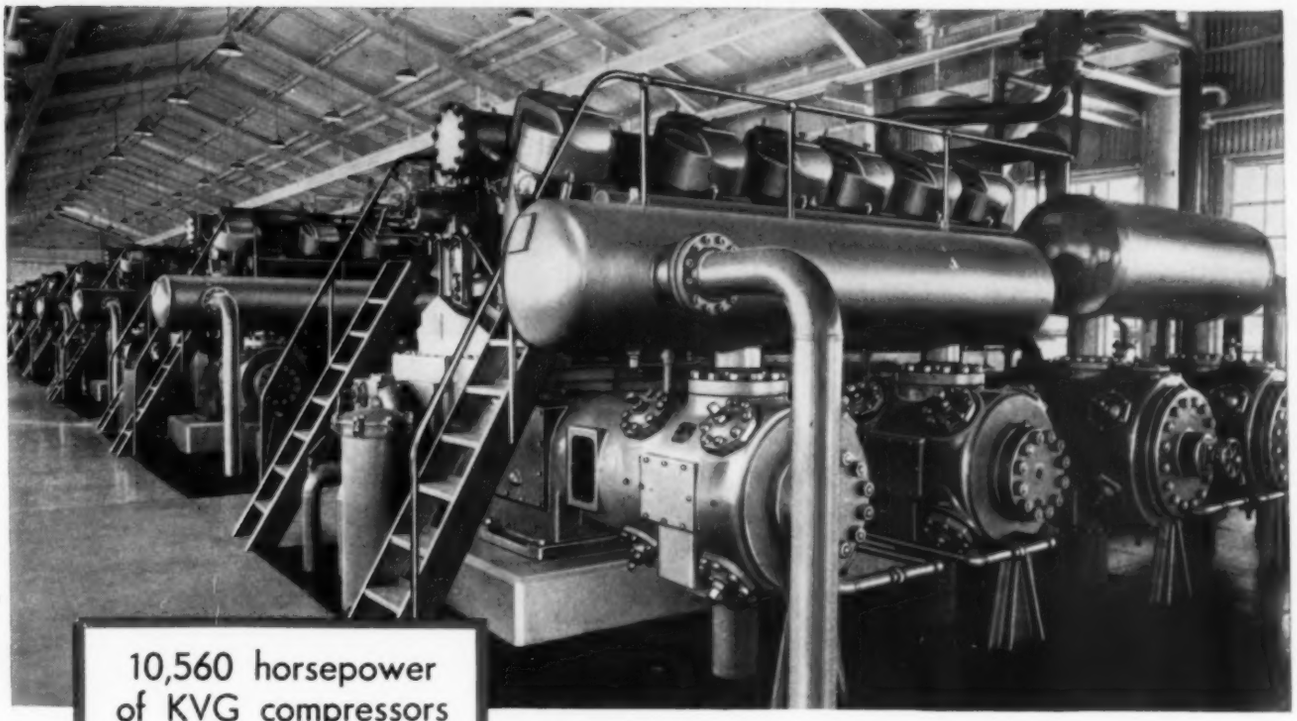

10,560 horsepower of KVG compressors at Permian Basin Pipeline Company

These eight Ingersoll-Rand KVG gas-engine compressors provide a total of 10,560 horsepower for a gas compression station of the Permian Basin Pipeline Co., a subsidiary of Northern Natural Gas Company. Each machine consists of a 12-cylinder, V-type, four-cycle gas engine with four compressor cylinders mounted on the same frame and driven from a common shaft.

On any service

I-R Gas-Engine Compressors

offer two basic advantages

Wide load fluctuations are unavoidable in many compressor applications. That's why the *flexibility* of I-R FOUR CYCLE gas-engine compressors is a big asset. They always deliver smooth, steady power all the way from no load to full load and at any speed from half to full rated rpm.

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Ingersoll-Rand four-cycle gas-engine compressors are available in sizes from 110 to 2000 horsepower. Call in your I-R representative when planning your next installation. His experience can save you time, effort and expense all along the line.

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4 CYCLE

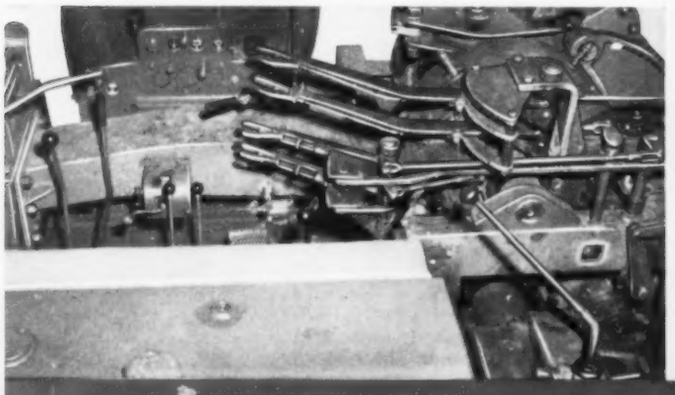
For more data on advertised products, use Readers' Service Cards, last page.

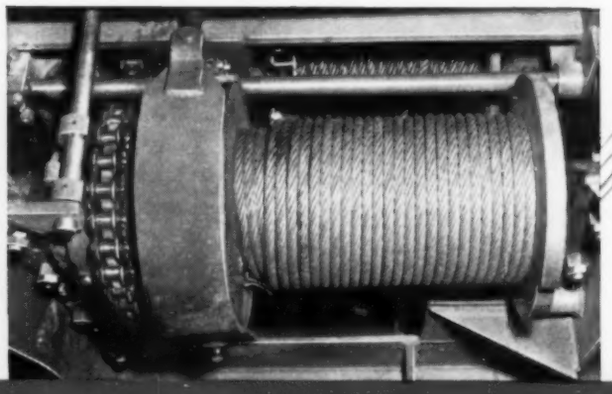
Lift capacities increased 2

comfort and visibility improved, in the new l

	TD-24	TD-18	TD-14	TD-9
Lift capacity of the new booms*	110,000	70,000	30,000	16,000
Lift capacity of '55 models*	90,000	38,000	24,300	13,440
Increase	22%	84%	25%	20%

**Figures show maximum lift in lbs at 4-ft overhang*





These important advantages also built into . . e

New vertical clustered control arrangement (shown above) for greater operator convenience and safety. **New boxed cable guards** for greater operator protection. **New boom weight design** (below) for better tractor balance and maneuverability. Choice of top or bottom-hinged removable hydraulic counter-weights.

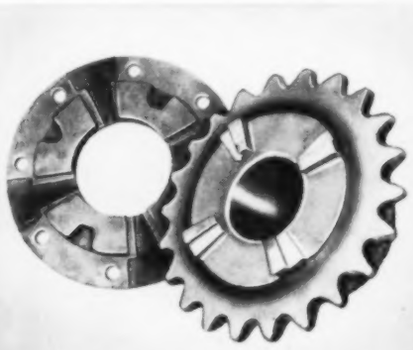
New individual shaft drum mountings, on TD-24, 18, 14, keep cable properly aligned with sheaves and boom. This increases cable life by preventing piling and crushing.

NEW TD-24, 190 net engine hp gear-drive or 200 net engine hp torque converter models, tops in operating ease and positive load control. Has exclusive high-low range Planet Power steering, with *live power on both tracks on every turn.*

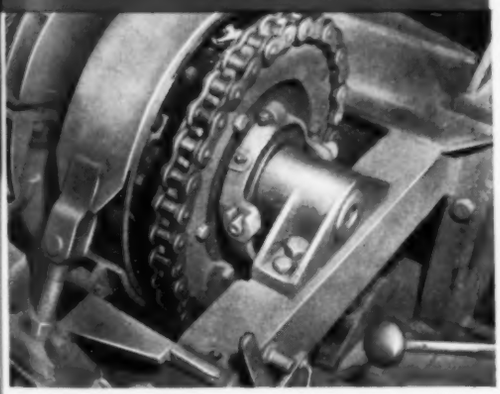
d20 to 84%, power boosted,

ew International-Superior Pipe-Boom Tractors

New non-slip, jaw-type drum clutches, with power both up and down, provide positive load control. Smooth operation assured by full-circle throw-out collars.

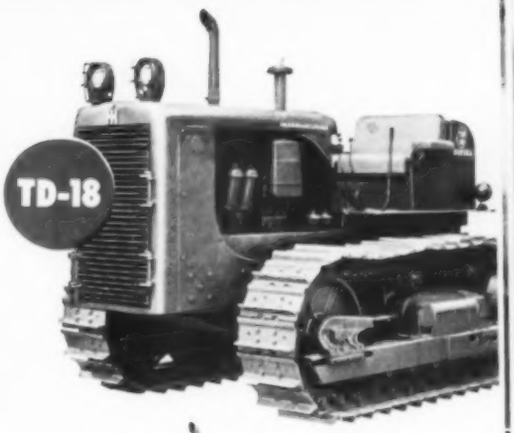


. . e new models

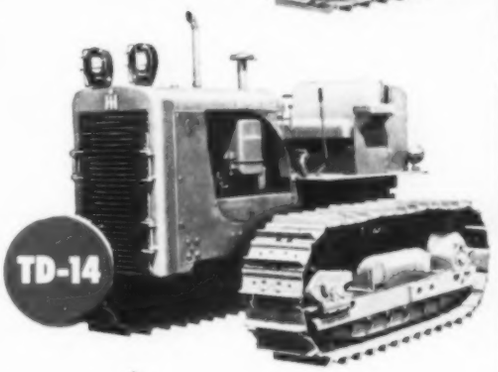


New self-energizing, wrap-around, heavy-duty drum brakes for greater operating ease. Need practically no adjustment, no maintenance. Fingertip control reduces operator fatigue.

NEW TD-18 (Series 182) delivers 124 net engine, 103 drawbar hp. Gives you excellent balance, exceptional all-around visibility, operating ease never before available. New heat-defying cerametallic engine clutch facings reduce lever-pull 50%, cut maintenance 75%.

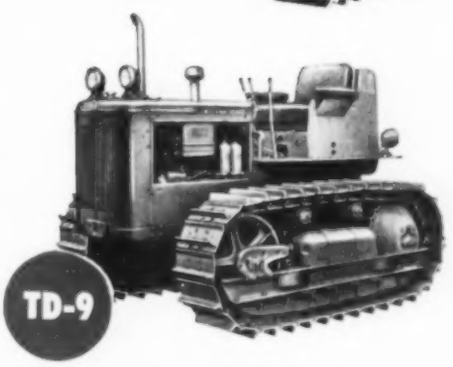


NEW TD-14 (Series 142) boosted to 95 net engine, 78.5 drawbar hp. Features "new-look" engineering, job-speeding visibility, new boom and blade carrying and operating strength. As on all sizes of International tractors, all-weather electric starting is standard.



NEW TD-9 (Series 91) now delivers 66 net, 54.5 drawbar hp—up 32%! Now in a new heavy-duty job range. Increased power backed by new, stronger power train and track frame, new operating and servicing ease.

Measure . . . compare . . . prove to yourself . . . these 1956 bonus-powered International-Superior pipe-boom tractors beat anything else on tracks! Try this "Big Inch" power for work-ability . . . operator preference . . . profit-potential! Ask your International Industrial Power Distributor for a demonstration! Call him today!



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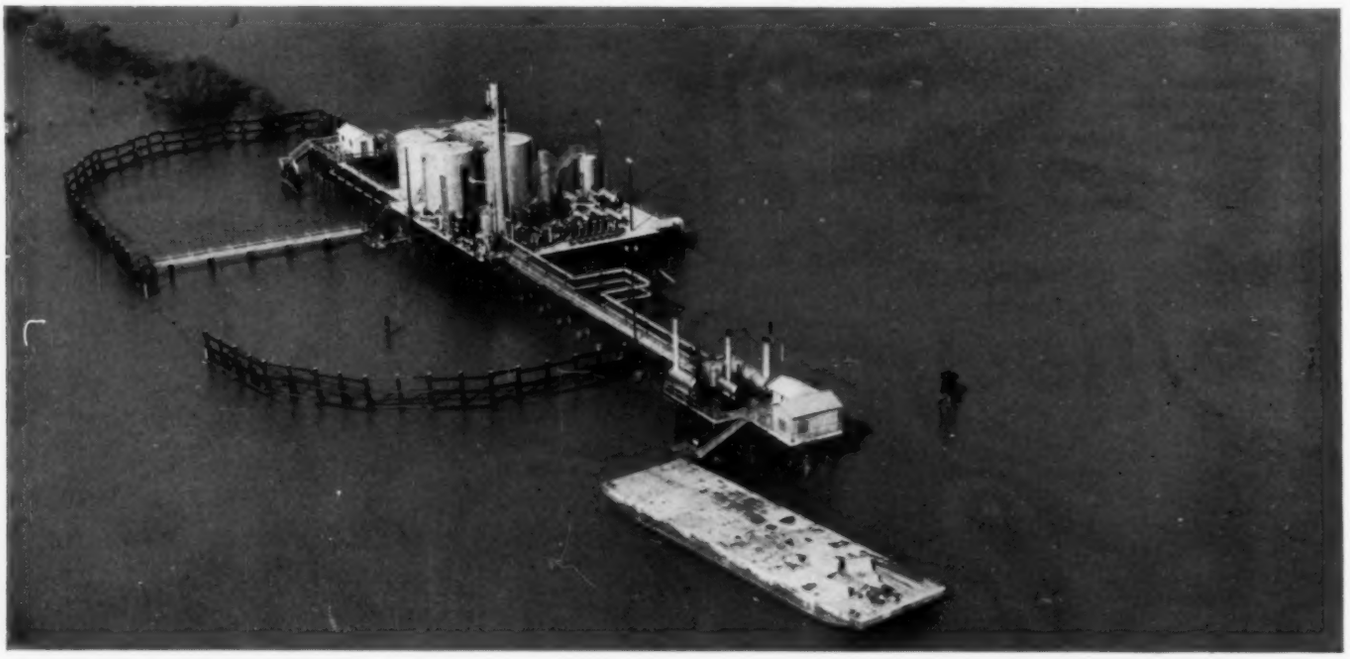
For details on any machine shown, see your International Industrial Power Distributor, or write International Harvester Company, 180 N. Michigan Ave., Chicago 1, Illinois: Manufacturers of Pipe-Boom, Crawler, and Wheel Tractors . . . Self-Propelled Scrapers and Bottom-Dumps . . . Tractor and Rubber-Tired Loaders . . . Diesel and Carbureted Engines . . . Motor Trucks.

How to do it

PIPE LINE HINTS

$10 is paid for each illustrated acceptable contribution. Mail to The Editor, PIPE LINE INDUSTRY, P. O. Box 2608, Houston 1, Texas



Fence Protects Platform from Fires Aboard Small Boats

Fires aboard small boats can be a serious hazard to water pipe line installations. In at least one instance in South Louisiana, a boat was abandoned and drifted under a platform causing a fire which completely destroyed the structure.

To eliminate the possibility of such an incident happening again, one company built a fence around the upstream (windward) side of the platform as shown. The fence is made up of wooden pilings driven into the bottom with crossbeams bolted to the pilings. Although it isn't fireproof, it will keep a burning craft away from the platform long enough to give crews a chance to put out the fire. Even if the crossbeams and pilings catch fire, they will burn only to the waterline and still provide a barrier to the underwater hull of a vessel.

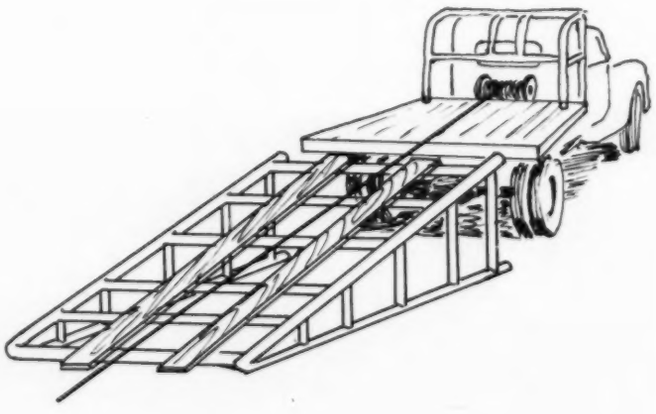
Each piling is braced by a second one driven into the bottom at an angle, making the barrier rigid enough to absorb the impact of fairly large barges or boats.

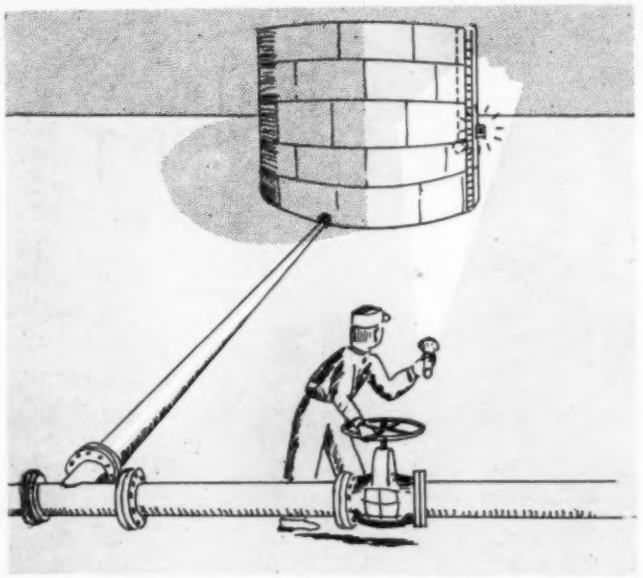
This particular platform also has a concrete-topped deck, which gives additional protection against fire and makes for easier cleaning.

Portable Pipe Ramp Speeds Equipment Loading on Truck

A portable ramp can be fabricated quickly from scrap pipe to save time in loading out construction equipment at a storage yard. Power machinery, air compressors and enamel kettles can be quickly sucked up on a truck by winch.

To fabricate the ramp, cut the pipe into sections and weld them together in the form shown. Scrap should be of large enough diameter to provide adequate strength; four-inch pipe will usually do the job. Planks are placed along the incline to support track equipment. The ramp is light enough to be towed where needed to load a winch truck in a hurry.

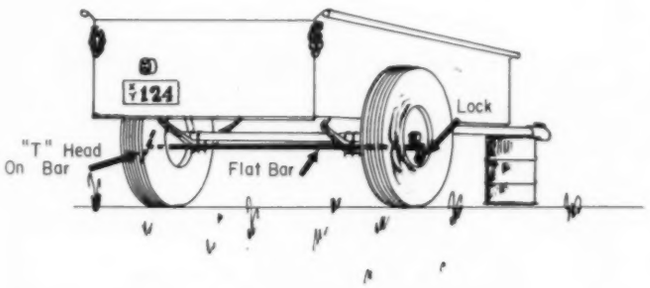




Reflector Tape Facilitates Filling Tanks at Night

Filling tanks at night can often be a ticklish task, especially where the tank's visible float gage is some distance from meters and valve controls. To solve the problem, one terminal gager covers the target of the float gage with red reflector tape, such as that widely seen on auto bumpers. This particular calibration tank often is filled at night and the meters are 300 feet away. By shining a flashlight on the glowing target, it can now be filled as easily as in the daytime.

Since the tank is being used as a pressure relief tank for the terminal, it not only eliminates losses but makes operation safer, too.

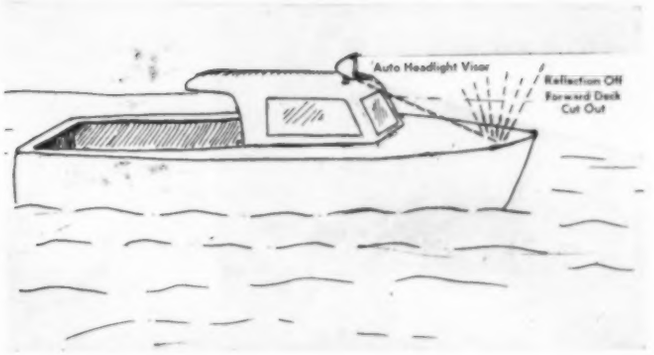


Bar Device Provides Lock For Tool Trailer Wheels

Tool trailers and other light mobile construction equipment left out along the right-of-way or at station sites can be locked securely with the simple device shown. The bar is inserted in the space between the hub and rim of the trailer wheels.

To make the device, weld a T-crosshead to one end of a flat bar cut to the desired length. A hole is drilled in the opposite end for the padlock.

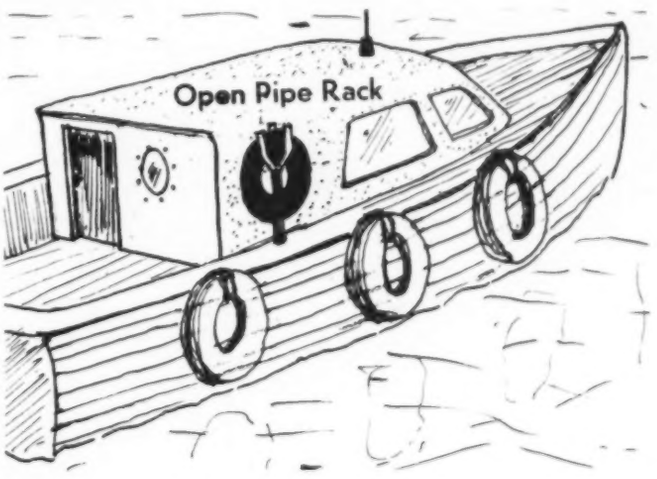
The bar may be carried with the trailer when not in use. To "lock up" trailers, the bar is inserted as shown and the padlock snapped providing a secure lock at low cost.



Visor on Spotlight Aids Night Vision on Boats

Crews of boats operating in a South Louisiana district found that new high intensity spotlights recently installed were often more harm than good. Much of the beam was reflected off the forward top-deck blinding the crew.

To correct this, the crew installed auto headlight visors on the lower sector of the spotlight, blanking out the beam to a point out ahead of the boat. At a cost of less than 20 cents per visor, the night vision and operating efficiency of the operators was greatly increased. Because of the corrosive environment, a high quality rust-proof finish was specified for both the light and visor.



Open Pipe Racks Provide Access to Life Preservers

Although it is standard procedure for companies operating in offshore and marine operations to stress wearing life jackets in boats, one oil pipe line installed life ring racks on all crew boats for extra "survival" insurance. These quick access holders on the starboard side of the boats may save a life, especially when a man overboard might not be a good swimmer or have a life jacket.

The rack is conveniently located where all crews can find it in an emergency. Should the boat sink, the ring will slip off the open rack and remain afloat, so a man in the water can swim to it if he needs help.

Extra racks may be installed as needed. Each is made from one-half-inch pipe bent as shown.

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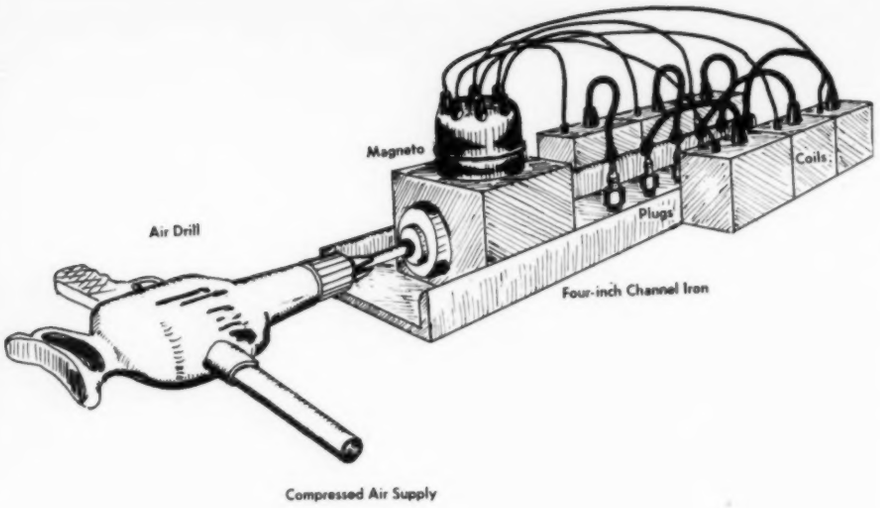
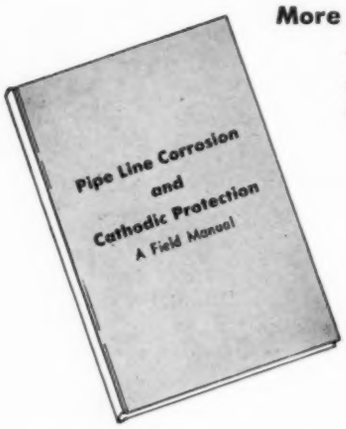


Make Test Stand for Ignition System

This inexpensive ignition stand is made from a piece of four-inch channel iron and uses an air drill to drive the magneto. To make it, cut the channel iron long enough to mount the magneto at one end and hold the coils and plugs as shown—a 24-inch section will accommodate the system for a six-cylinder engine. Drill and tap the sides of the channel iron to mount spark coils on each side. Then drill and tap the bottom for the spark plugs.

Wiring is installed from the magneto to coils and plugs just as it would be on the engine. An air drill drives the magneto through a fiber block coupling fitted with a shank for the drill chuck.

This easily-built test stand will



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By MARSHALL E. PARKER

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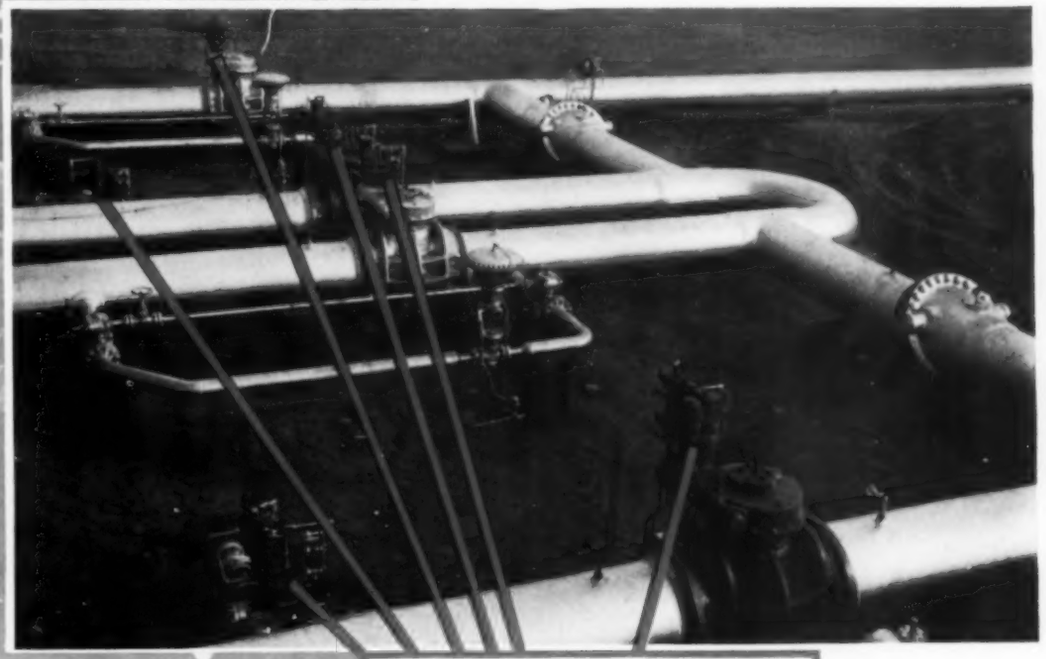
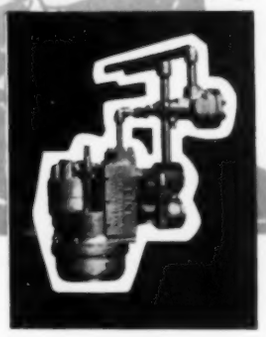


All E.I.M. Installations of This Type Conform With "Emergency Shutdown Facilities" (No. 843.431 Section 8, ASA B31.18-1955)

EVERYWHERE AND ANY TIME THERE'S A FIRE EMERGENCY— YOU'LL FIND THE G-2 CONTROLLING THE SITUATION



EIM G-2 valve controls guide the flow of gas through compressers where the pressure is increased.

With a breach in the line there comes a marked reduction in pressure which, within a matter of seconds, automatically closes the G-2 valve control and re-routes the gas through an undamaged line. In addition to this, a vent valve in the affected area is opened sending a jet of gas from the damaged line spewing harmlessly into the air, thus reducing fire losses to a minimum.

G-2 valve controls stand watch twenty-four hours a day in silent protection of life, limb, property, and our valuable natural resources.

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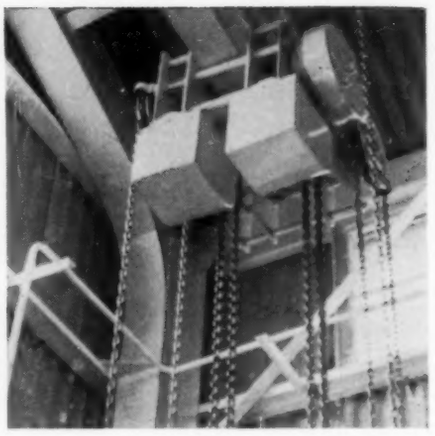
Valve Controls • Speed Reducers
Cooling Tower Drives • Control Valves

For more data on advertised products, use Readers' Service Cards, last page.

come in handy to check engine firing order, and performance of magnetos, coils and plugs. It also can be used as a good training aid to teach new maintenance men about the ignition system of any engine.

Hopper Eliminates Danger Of Dangling Hoist Chain

To eliminate the nuisance of excess chain dangling from an overhead hoist, one gas compressor station maintenance crew made the hopper shown. Mounted just beneath the carriage of

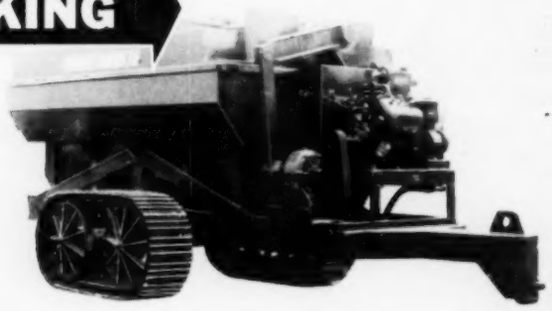


the hoist, the hopper catches the free part of the chain as it passes over the chain sprocket.

The assembly is made from ordinary quarter-inch plate welded into a box shape as shown. It is easily adaptable for mounting on any hoist.

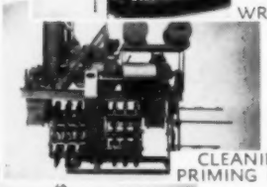
Use of the hopper saves maintenance time by keeping the working space around engines and compressors free of unnecessary dangling parts of chain. It is safer too, as there is less chance of injury to repairmen by the free chain.

NO COKING

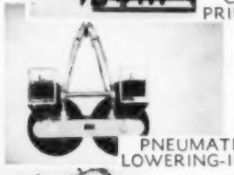


COATING AND WRAPPING MACHINES

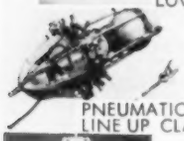
PERRAULT-AMERICAN 25 BBL KETTLE



CLEANING AND PRIMING MACHINES



PNEUMATIC-TIRED LOWERING-IN CRADLE



PNEUMATIC-INSIDE LINE UP CLAMP

PIPE CRADLES

GLASS, ASBESTOS AND KRAFT WRAP

ROCK SHIELD

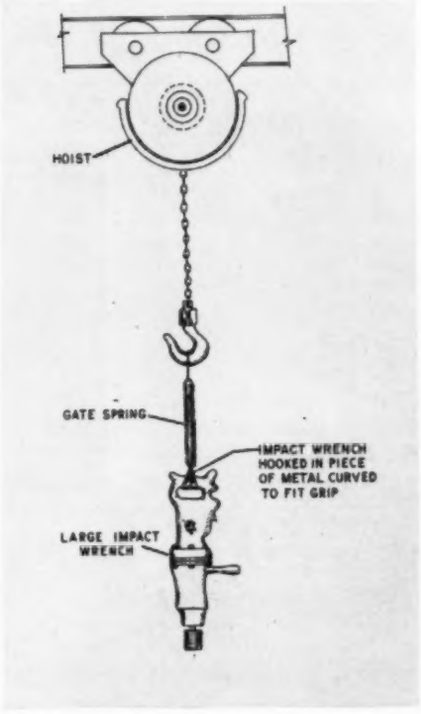
Agitator mat bars scrape entire kettle bottom every 3.35 seconds, allowing no material to remain on bottom long enough to burn, eliminating coking completely. Mat motion is slow enough so dope is not "whipped." Heavy mat will not float, scrapes bottom thoroughly.

OTHER FEATURES: Actual capacity is 25 bbl.-plus; Completely insulated; Melts dope fast; Drain valve inside kettle requires no pre-heating; Burner gravity-fed, no pump required; Fuel is diesel oil; Fuel tank capacity is 50 gals. Perrault-American 25 bbl. Kettles give contractors the most economical, rapid, maintenance-free-and-easy service. Other sizes available. For more information write or phone.

AND: PATCH POTS, BURNERS AND ACCESSORIES. TONGS, SLING BELTS, AND HOOKS, LINE-UP CLAMPS. HAND TOOLS. SUPPLIES AND EQUIPMENT OF EVERY SORT.

PERRAULT EQUIPMENT COMPANY

1130 N. BOSTON — TULSA, OKLA. — TELEPHONE LUther 5-1103



Station Hoist Makes Maintenance Easier

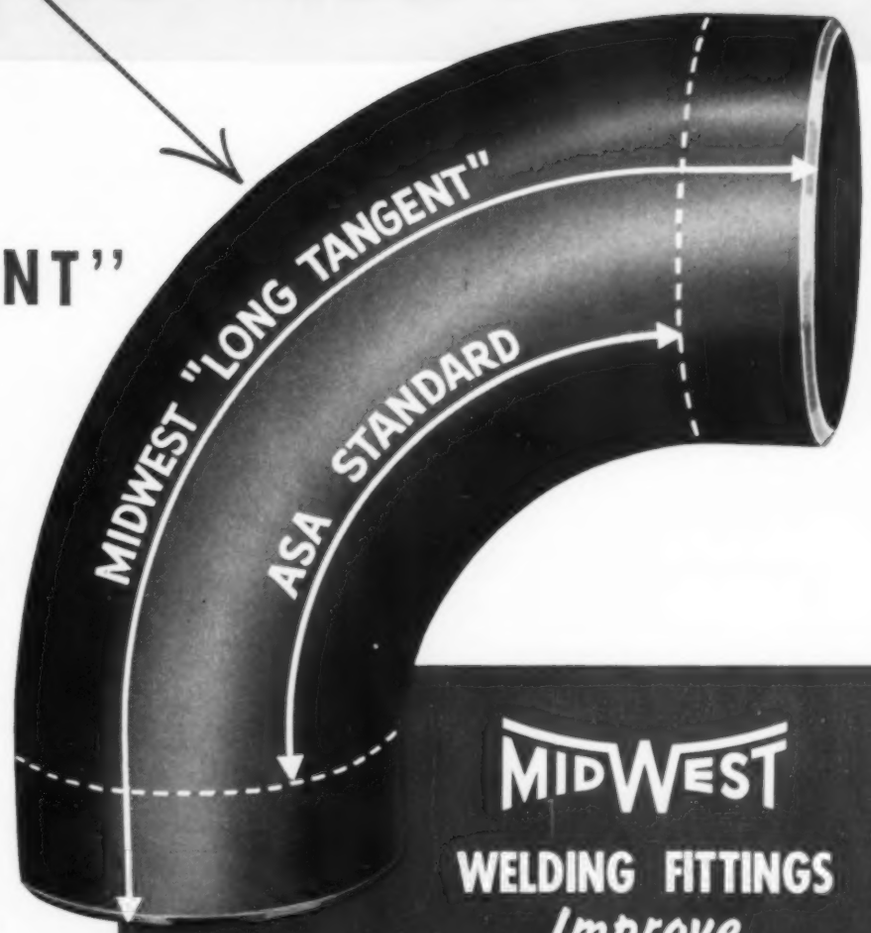
Here is an idea a compressor station maintenance crew thought up to cut down on lifting and carrying heavy tools around during overhaul. The station hoist was used to hold the heavy air-driven impact wrench and other equipment, suspending it at a convenient working height. A steel gate spring and a band of metal curved to fit the handle support the wrench as shown.

When heavy tools need to be moved from one work station to another around the compressor or engine, simply lift them with the hoist and roll them to the next job. When in use, the spring and grip support permits freedom of movement and faster work with less strain and possibility of injury from dropping the large tools.

King Size (but at no extra cost)

MIDWEST

"LONG TANGENT" ELBOWS



Among all standard welding elbows, only Midwest "Long Tangent" Elbows can be described as "*King Size*" . . . only they have the long straight ends which equal ¼ of the nominal fitting diameter (a 12" Midwest "Long Tangent" Elbow has tangents 3" long). This greater length is responsible for significant savings on many piping systems (see advantages listed below). For additional information, ask your Midwest distributor or write us for Catalog 54.

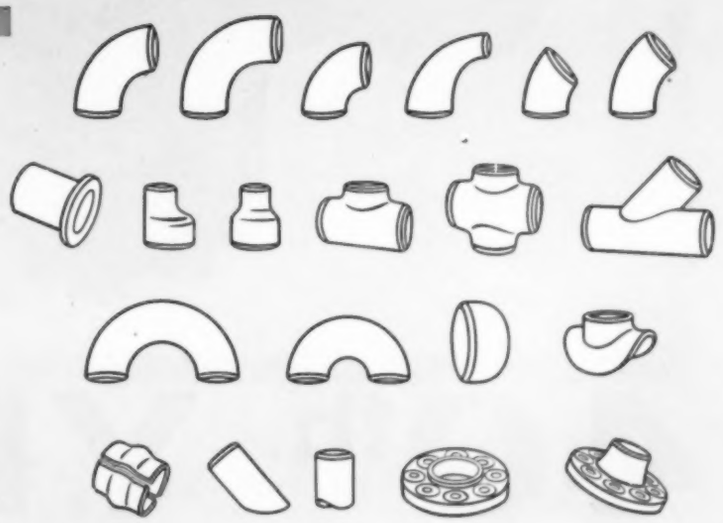
MIDWEST PIPING COMPANY, INC.
Main Office: 1450 South Second Street, St. Louis 4, Mo.
Plants: St. Louis, Clifton, N. J., and Los Angeles

Sales Offices:
New York 7—50 Church St. • Chicago 3—79 West Monroe St. • Cleveland 14—616 St. Clair Ave. • Los Angeles 33—520 Anderson St. • Houston 2—1213 Capitol Ave. • Tulsa 3—224 Wright Bldg. • Miami 34—2103 Le Jeune Rd. • Boston 27—426 First St.
STOCKING DISTRIBUTORS IN PRINCIPAL CITIES

MIDWEST
WELDING FITTINGS *Improve* PIPING DESIGN and REDUCE COSTS

ADVANTAGES OF MIDWEST "LONG TANGENT" ELBOWS

- ★ They save pipe.
- ★ They often eliminate short nipples and their extra welds.
- ★ They save time and money in lining up and clamping pipe and fitting.
- ★ They make it easier to apply slip-on flanges.
- ★ They remove the circumferential weld from point of maximum stress and can be sleeved.
- ★ THEY COST NO MORE THAN OTHER ELBOWS.

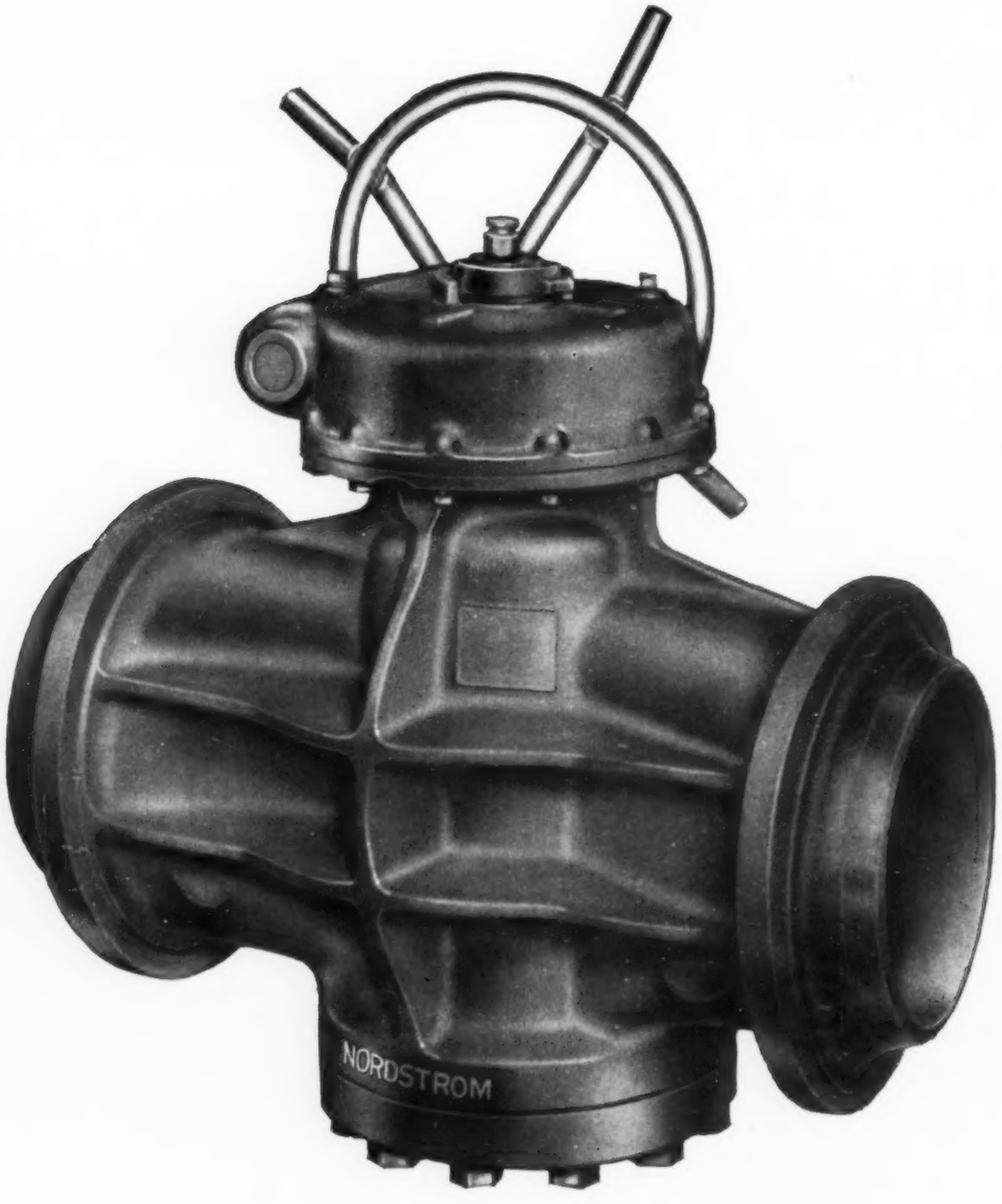


MIDWEST HAS THE MOST COMPLETE LINE

Z323

ROCKWELL-

Often Copied...



40th YEAR *of*

Nordstrom VALVES

Never Equaled

Rockwell-Nordstrom is the *original* lubricated plug valve. But that is only part of the story behind forty years of lubricated plug valve leadership. Starting with the first valve, *every major development* in lubricated plug valves has come to you *first* in a Rockwell-Nordstrom valve. Today, as always, the *oldest* lubricated plug valve is also the *newest* in terms of better performance, longer life and lower cost.

Below are listed only a few of the more than ninety basic Rockwell-Nordstrom valve and lubricant innovations. They are the reasons why Rockwell-Nordstrom valves—although often copied—have *never* been equaled. Rockwell Manufacturing Company, Pittsburgh 8, Pa.

Canadian Valve Licensee: Peacock Brothers Limited

ROCKWELL-Nordstrom VALVES

Lubricant Sealed for Positive Shut-off

first... for forty years *Here are just a few of more than ninety basic valve and lubricant innovations that have maintained the leadership of Rockwell-Nordstrom valves—through better performance, longer life and lower cost.*

- **FIRST Lubricated Plug Valve**
- **FIRST Sealdport* pressurized lubricant sealing**
- **FIRST Hydraulic plug jacking for fast, dependable operation**
- **FIRST Hypreseal* for high pressure plug valve service (still exclusive)**
- **FIRST Special plug and body coatings—longer life on "tough" services**
- **FIRST Automatic shut-off valves for gas pipelines**
- **FIRST "Self-Energizing" valve lubricants**
- **FIRST Line of special and general purpose valve lubricants**
- **FIRST Multiport lubricated plug valves for 3-way and 4-way flow control**
- **FIRST Lubricated plug valve for low temperature service**
- **FIRST Venturi valve for lower cost on larger lines**
- **FIRST Lubricated plug Christmas tree valves**

*Registered trade mark Rockwell Manufacturing Company

lubricated plug valve leadership

Lone Star Steel is a major supplier to the great Pacific Northwest Pipeline

The superiority of Lone Star API pipe is built in. There's quality control in every step . . . starting with top quality iron and steel scrap, then going through the vast open hearth furnaces, the soaking pits, rolling mills and finally through the pipe mills.

Lone Star line pipe is renowned for its bending quality and workability . . especially important in the rugged Pacific Northwest country. Veteran pipeline men are strong in their praise that Lone Star pipe speeds construction.

Neighbor, wherever you are, specify Lone Star . . and we both get a good deal!

Lone Star STEEL COMPANY

LSS

EXECUTIVE-SALES OFFICES
W. Mockingbird Lane at Roper • P. O. Box 8087 • Dallas, Texas

DISTRICT SALES OFFICES
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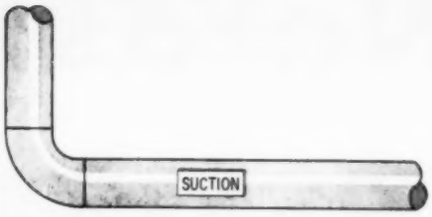


Name Plates Are Guide To Station Piping

Proper marking of station valves and piping with stenciled plates will help new employes learn the flow system more quickly. Low-cost plates can be made in the station's shop by cutting one-eighth inch half hard aluminum strips to the length needed. Width is one-half inch with one-quarter stenciled letters.

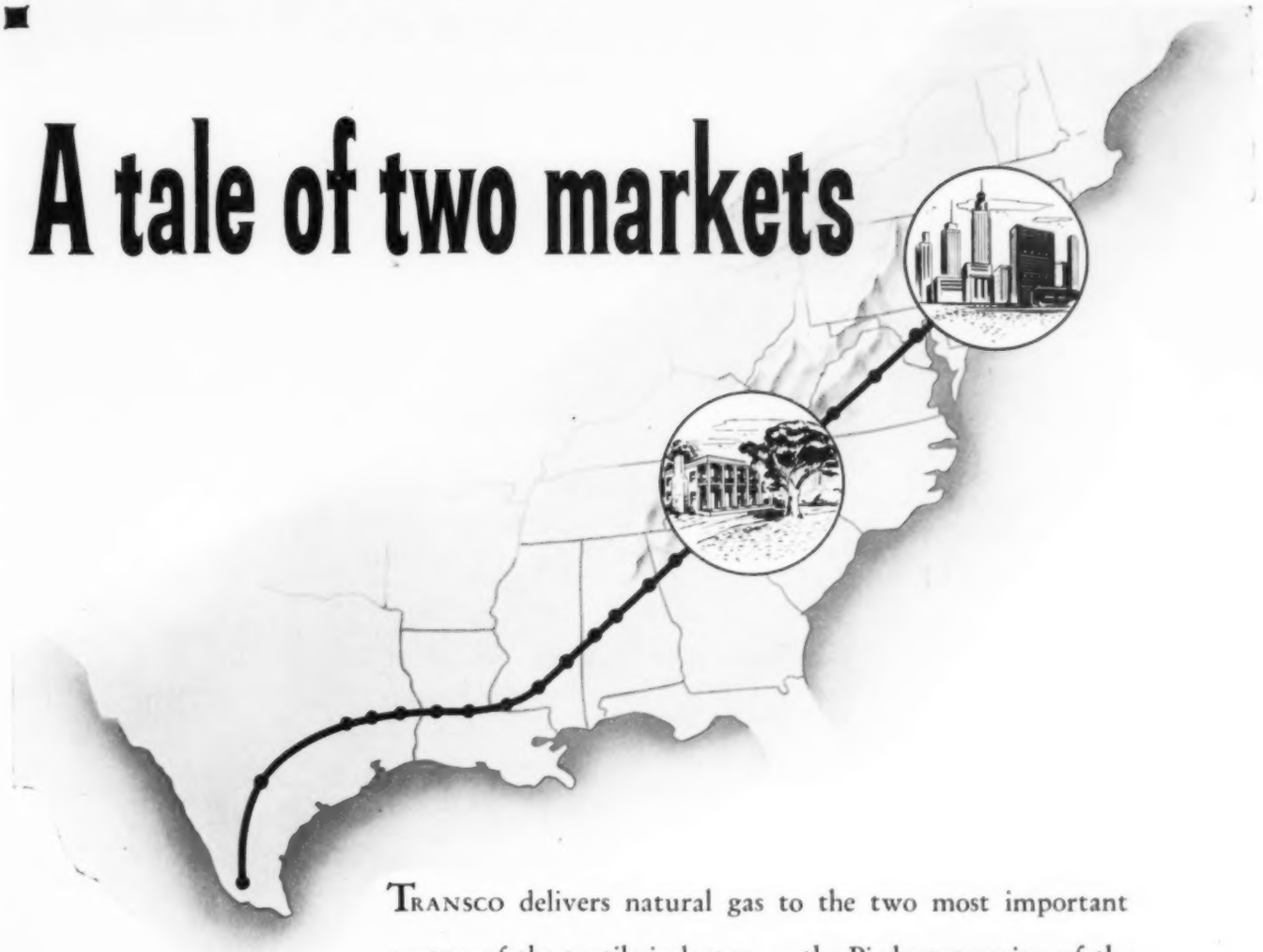
The face is painted black with yellow lettering so that the marking plate can be identified easily. The marking plates are curved to fit the pipe or fitting. They can be fastened with household cement or metal bands.

Field Stand Protects Panels Off Engines

Side panels are often taken off air cooled field pump engines during summer months to get extra cooling. One pipe line gager made an effective stand near the engine to keep the panels from being damaged by animals and trucks.

To make the stand, cut a two-inch pipe section about five feet long and drive it into the ground. Tack weld two short strips of angle iron on opposite sides of the stand about a foot off the ground. A 2½-inch pipe collar with similar angle iron clips drops down over the top to hold the panels securely.

A tale of two markets



TRANSCO delivers natural gas to the two most important centers of the textile industry . . . the Piedmont region of the Carolinas . . . and Greater New York. Homes of the New York and Piedmont areas are particularly important markets for natural gas. At both outlets, and throughout the populous area in between, demand for natural gas is growing. Transco's pipeline is ready to help producers supply it.

HELPING TO EXPAND THE MARKETS FOR TEXAS-LOUISIANA NATURAL GAS

TRANSCONTINENTAL GAS PIPE LINE CORPORATION

TRANSCONTINENTAL GAS PIPE LINE CORPORATION

For more data on advertised products, use Readers' Service Cards, last page.

BrakeSol

ELIMINATES COSTLY PARAFFIN REMOVAL METHODS

HOLDS PARAFFIN IN SUSPENSION from FORMATION to REFINERY

BRAKESOL is economical and safe to use, prevents and removes paraffin from the tubing, flow lines, tank bottoms and pipe lines. Effective on both asphalt and mixed-base paraffin.

FOR SERVICE CONTACT YOUR NEAREST BRAKESOL SALES ENGINEER

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The National Supply Co
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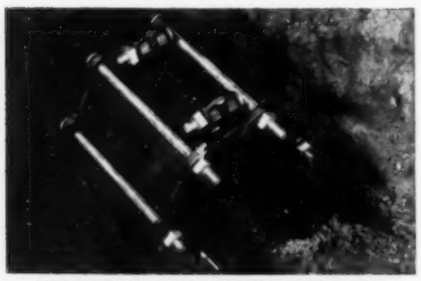
BRAKESOL, Inc.
P.O. Box 9506 Okla. City, Okla.

REPAIR LEAKS
QUICKLY—PERMANENTLY

SKINNER-SEAL PIPE JOINT CLAMPS stop leaks at joints. Put on under pressure—without interruption of service. Quick, simple, lasting repair. Sizes 1/2" to 24" incl. in stock.



SKINNER-SEAL COLLAR LEAK CLAMP—designed to stop every type of collar leak in oil and gas lines. Sizes: 2" to 13" inclusive.

M. B. SKINNER COMPANY
SOUTH BEND 21, INDIANA, U. S. A

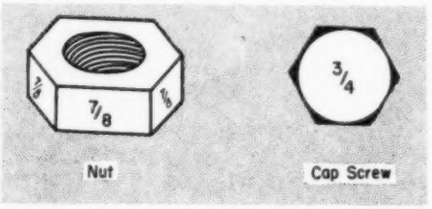
Guard Protects Low Installations

Here is an inexpensive guard to protect valve handles and other equipment located close to the ground. This sturdy frame is made of scrap 2-inch pipe cut to size and welded into a unit. The unit is spotted in the proper location and the legs driven into the ground, anchoring the guard firmly in place.

Frames can be made to any dimensions by sawing the horizontal member through and sliding a length of small diameter pipe inside the 2-inch pipe to increase length if desired.

Identifying Bolts Speeds Station Maintenance Jobs

This time-saving idea will help new station maintenance men become familiar with sizes of bolts and studs. Simply stencil nuts, bolts, and studs with their size during any spare time before overhaul begins. A set of ⅛-inch steel stencil figures can be used to mark each flat on nuts and the head of bolts and studs as shown.



A few minutes work by operating personnel will save valuable time and labor during station overhaul periods.

KEEP PURE DRINKING WATER ALWAYS HANDY

insist on the highest quality

Gotkool
water cans and coolers

Specify **"GOTKOOL"** the next time you order water cans or coolers. **"GOTKOOL'S"** exclusive construction keeps water cooler . . . fresher . . . purer. Extra wide, snug-fitting, splash-proof top keeps out impurities. Non-leaking, push-button faucets, either extended or recessed flush mounted. *Buy* **"GOTKOOL"** *at your supply store today.*

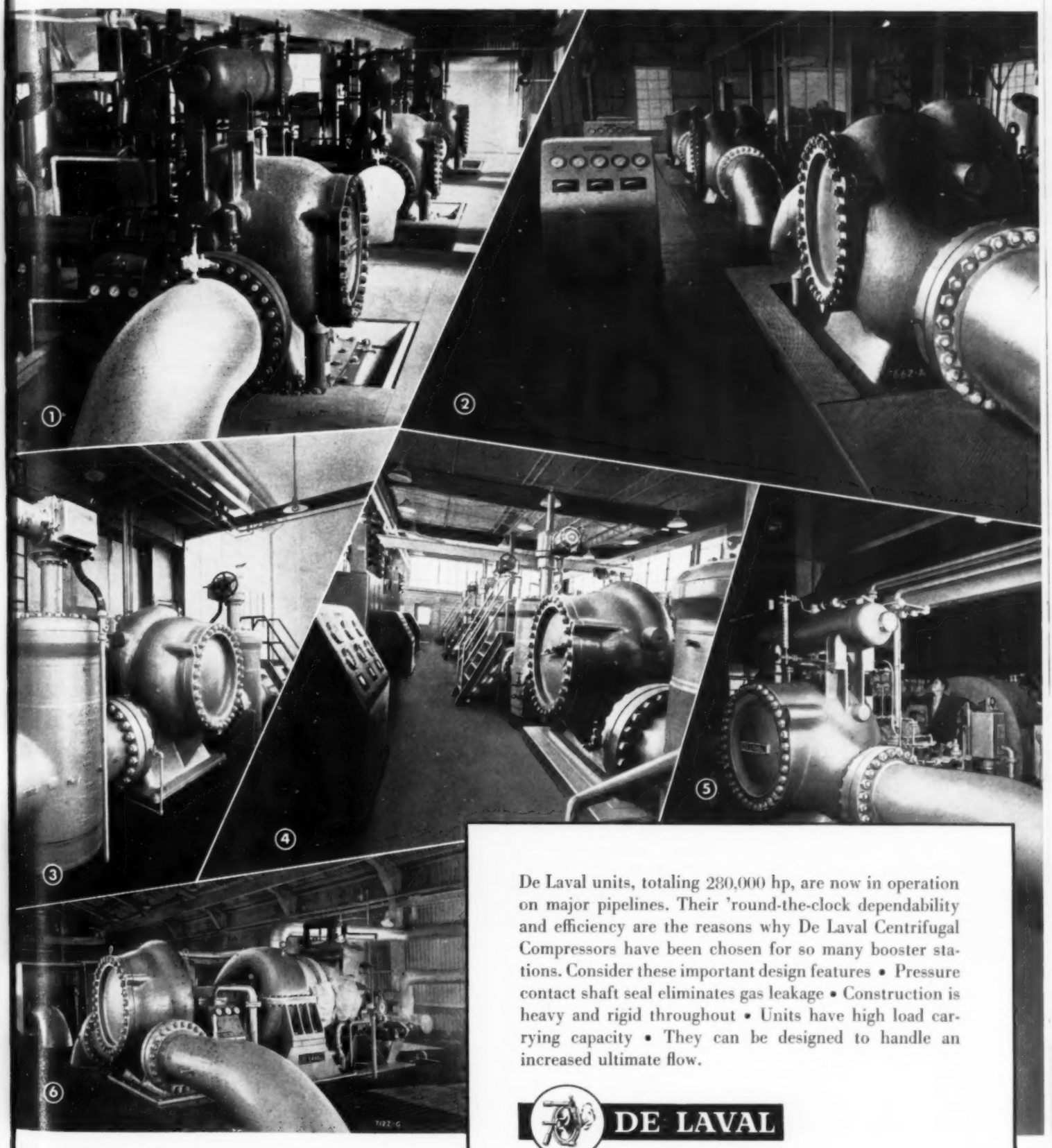
GOTKOOL Water Cooler — made in 2, 3, 5, 8, 10, 15, and 20-gallon sizes with extended or recessed flush-mounted faucet optional. *(Note: 15- and 20-gallon sizes available with extended faucet only.)*

GOTKOOL Water Can — made in 1½, 2, 3, 5, 10, and 20-gallon sizes without faucets. Extended or recessed flush-mounted faucets available at slight additional cost. *(Note: 15- and 20-gallon sizes available with extended faucet only.)*

Insist on the genuine — look for the *Blue and Black Label* with the name "GOTKOOL" in Red.

H. P. GOTT MFG. COMPANY
WINFIELD, KANSAS

These pipelines depend on **DE LAVAL** *Centrifugal Compressors*



Located in booster stations of:

1. *Northern Natural Gas Company*
2. *El Paso Natural Gas Company*
3. *Southern Counties and Southern California Gas Companies*
4. *Texas Eastern Transmission Corporation*
5. *United Gas Pipe Line Company*
6. *Transcontinental Gas Pipe Line Corporation*

De Laval units, totaling 280,000 hp, are now in operation on major pipelines. Their 'round-the-clock dependability and efficiency are the reasons why De Laval Centrifugal Compressors have been chosen for so many booster stations. Consider these important design features • Pressure contact shaft seal eliminates gas leakage • Construction is heavy and rigid throughout • Units have high load carrying capacity • They can be designed to handle an increased ultimate flow.

DE LAVAL

Centrifugal Compressors

DE LAVAL STEAM TURBINE COMPANY

884 Nottingham Way, Trenton 2, New Jersey

DL881

Pipe Line Men

IN THE NEWS

J. T. Stewart

J. J. Ball

W. M. Stephens

George Ewing

P. O. Kyler

J. D. Bland

Texas Eastern Transmission Corporation has announced a reorganization of the general office Engineering department. The reorganization effected a rearrangement of responsibilities, and consolidated several individual activities into the department's primary divisions.

Reassignments included **C. W. Marvin,** from chief of plans and research to supervising engineer; **J. T. Stewart,** from engineer to assistant supervising engineer; **J. J. Ball,** from engineer to assistant supervising engineer; **W. M. Stephens,** from engineer to supervisor of design and construction division; **G. H. Ewing,** from engineer to supervisor of plans and research division; **T. M. Hughes,** from engineer to supervisor of administrative division; **P. O. Kyler,** from engineer to assistant supervisor of administrative division; and **J. D. Bland,** from engineer to acting supervisor of products division.

James N. Fuquay has been appointed assistant chief engineer of **Sun Pipe Line Company's** Crude Lines department in Beaumont, Texas. Other Crude Lines department appointments are **Jesse D. Duplissey,** formerly assistant superintendent in the Beaumont office, who succeeds Fuquay as area superintendent at Corpus Christi; and **Charles W. Gibson,** formerly district foreman at Snyder, Texas, who succeeds Duplissey. **Rupert Short,** district foreman at Seabreeze, Texas, assumes Gibson's former duties.

•

Fred E. Wilson, field superintendent in charge of **Pacific Gas & Electric Company's** "Super Inch" natural gas line since 1950, will retire from service with the company July 1 and will be succeeded by **Ralph S. Nabors,** Northern Division superintendent. Wilson has been with the company since 1922 and holds membership in the Pacific Coast Gas Association's "49'er Club." Nabors moves from Kettleman compressor station to Rosedale, near Bakersfield. He has been with Pacific Gas & Electric since 1928.

Three other employes also are promoted in this change. **Harry Prudhomme** of Bakersfield, a transmission engineer at Rosedale, succeeds Nabors as Northern division superintendent. Formerly Prudhomme was in Santa Cruz as assistant gas engineer of Coast Counties Gas and Electric Company until its merger into PG&E in 1954. **Robert Callow** of Bakersfield, who has been with the company since 1938, remains at Rosedale in Prudhomme's position. Callow has been the associate transmission engineer. **Richard I. Stark,** association engineer in Gas Operations in San Francisco, becomes a transmission engineer at Rosedale.

W. L. Stanton, vice president—gas supply for **Texas Gas Transmission Corporation,** has announced the moving of Gas Supply department offices from Shreveport to Houston. The move was made in order for the department to be closer to the Louisiana and Texas Gulf Coast areas where Texas Gas purchases major supplies of natural gas. Officials to be located in the Houston office besides Stanton are **Charles P. Moreton,** supervisor of gas contracts, and **Monty G. Martin,** chief geologist.

•

M. C. Alcorn has been named manager of **Shell Oil Company** pipe lines on the Pacific Coast. The Shell Pipe Line department on the Pacific Coast has been transferred from the Exploration and Production department to Transportation and Supplies. The change puts transporting of all natural gasoline, commercial gasoline and products and crude oil under the direction of one department. Alcorn formerly was assistant manager of the Pipe Line department. His former position is now filled by **F. O. McKeany,** who was superintendent of oil movements.

•

James E. Grubbs has been appointed assistant superintendent of dispatching for **Texas Gas Transmission Corporation** assigned to the Owensboro, Ky., headquarters. Formerly division superintendent at Guthrie, La., and Memphis, Grubbs will assist in supervising supply, transmission and delivery of natural gas throughout the Texas Gas system.

•

John H. Williams, president of **William Brothers,** has been awarded the Order of Condor by the Republic of Bolivia for outstanding service to the Bolivian nation. The highest honor Bolivia can give, the order was authorized by special decree of the president and was conferred upon Williams by the Minister of Foreign Relations. Williams Brothers has constructed all the pipe lines built in Bolivia in recent years.

Newport Steel

SPECIALISTS IN 4" and 6" LINE PIPE*

THE high quality of electric weld line pipe from Newport Steel is the result of careful and rigid control in every process . . . from electric furnace through rolling, forming and final hydrostatic testing. With a background of over 70 years' steelmaking experience, plus modern facilities and expert personnel, Newport is well qualified to serve your 4" and 6" line pipe* needs. Made in standard wall, and thin wall for maximum economy; to Newport's own rigid standards, as well as API and ASTM specifications. Contact Newport first, for line pipe or any other of the products listed below.

API

***SIZES AND WEIGHTS AVAILABLE**

O.D.	Wall	Wt. Per Ft
4½	.125"	5.84
	.142"	6.61
	.156"	7.25
	.188"	8.64
	.219"	10.00
	.237"	10.79
6⅝	.134"	9.29
	.156"	10.78
	.188"	12.89
	.219"	14.97
	.250"	17.02
	.280"	18.97

ECONOMICAL WATERAIL-TRUCK DELIVERY

Newport Steel is ideally situated on the Mississippi-Ohio River system and the great Cincinnati rail-truck hub. New barge facilities, 7 major railroads, 143 motor carriers enable Newport to give economical, dependable delivery to the entire area of the Middle West and South.

PRODUCTS OF NEWPORT STEEL

Cold-Rolled Sheets
Hot-Rolled Steel in Coil
Hot-Rolled Pickled Steel in Coil
Hot-Rolled Sheets
Hot-Rolled Pickled Sheets
Galvanized Sheets
Galvannealed Sheets
Colorbond Sheets
Electrical Sheets
Alloy Sheets and Plates
Electric Weld Line Pipe
Roofing and Siding
Eave Trough and Conductor Pipe
Culverts

Newport Steel CORPORATION

NEWPORT, KENTUCKY

YOUR CONFIDENCE IS JUSTIFIED WHERE THIS FLAG FLIES

A SUBSIDIARY OF MERRITT-CHAPMAN & SCOTT CORPORATION

Hugh M. Pendley

Jack W. Seaman

John J. Franks

F. D. Stockman

Northern Natural Gas Company has announced four staff appointments. **Hugh M. Pendley** has been named purchasing agent, filling the vacancy left by the recent death of **C. Frank Martin.** Replacing Pendley as assistant superintendent of compressor stations is **Jack W. Seaman,** who formerly was staff assistant. **John J. Franks** has been appointed director of a newly created data processing section. **F. D. Stockman** has joined the Gas Supply department as staff assistant and chief of services of the company gas reserves and availability section headed by Dean Grimm.

Pendley has 20 years service with Northern, the last eight as assistant superintendent of compressor stations dealing with plant construction. He has had experience in purchasing, pipe line, engineering, compressor and distribution. Pendley will be responsible for the purchasing of materials for the 10,000 mile natural gas transmission system.

Seaman, an 18-year man in the company's Compressor department, will assist in the operation and maintenance of the department. Franks, who has five years service with Northern in the Accounting department, has been accounting systems supervisor. He will handle the operation of an electronic digital computer recently contracted for by the firm which will be used for research and engineering operations and to augment Northern's present electronic data processing.

Stockman was formerly with Phillips Petroleum Company for 12 years.

•

V. W. Tipton of **Shell Pipe Line Corporation,** Houston, has been named by the Texas Safety Association as the petroleum industry's safest fleet truck driver in Texas. Tipton has driven more than 950,000 accident-free miles during his 23 years with Shell.

•

Commissioner Claude L. Draper, a member of the **Federal Power Commission** since it was reorganized as an independent agency in 1930, will retire at the expiration of his five-year term June 22, 1956. Commissioner Draper has served under four presidents. Prior to his appointment to the FPC in 1930, Draper was vice president of the Association of Practitioners before the Interstate Commerce Commission and chairman of the Committee on Freight Rates of the National Association of Railroad and Utilities Commissioners.

Oil Pumping "Automation" an Actuality with this WISCONSIN-POWERED Installation

Natural gas provides a continuous fuel supply for this Model TFD 2-cylinder Wisconsin Air-Cooled Power Unit, equipped with clutch reduction, direct-connected to a medium pressure rotary pump, delivering 35 bbls. per hour at 300 lbs., operating in an oil field in Stephens County, Okla.

A Time Clock automatically shuts down the unit at a predetermined time, doing away with the necessity of having the operator come back to the pump and engine after once started.

Automatic High Temperature Safety Switch and Low Oil Cut-out Switch provide positive safeguards against preventive maintenance negligence.

A vacuum-operated Gas Regulator automatically shuts off the gas when the engine stops as another self-controlled operating and safety feature.

Automatic, continuous AIR-COOLING at temperatures up to 140°F provides the final step in efficient, safe oil-well-pumping *Automation!*

And to top it off, Wisconsin heavy-duty engineering design and construction are assurance of low-cost maintenance, dependable operation and long engine life. Reasons why it pays to specify "Wisconsin Power" for *your* oil field equipment.

WISCONSIN MOTOR Corporation
MILWAUKEE 46, WISCONSIN
World's Largest Builders of Heavy-Duty Air-Cooled Engines

WRITE TO HARLEY SALES CO.
619 SOUTH MAIN STREET • TULSA, OKLAHOMA
3420 McKINNEY AVENUE • HOUSTON, TEXAS
305 SOUTH MAIN STREET • WICHITA, KANSAS
OIL FIELD DISTRIBUTORS FOR WISCONSIN ENGINES AND ALL TYPES OF UTILITY UNITS

A 8806-1½I

Pumping Progress Report

FOR PIPE LINE ENGINEERS

An advertisement prepared by the Aldrich Pump Co., Member of Hydraulic Institute, U.S.A.

PUMP INSPECTION, MAINTENANCE AND REPAIR are jobs too frequently ignored in the design of production pumps. This has been verified by a survey of more than 15,000 pump installations. Speed and economy of maintenance was frequently quoted as a major factor in pump selection.

SECTIONALIZED FLUID-ENDS offer one of the best ways to guarantee both speed and economy in pump maintenance. As originated by ALDRICH Pump Co. Engineers, the Sectionalized Fluid-End comprises four main assemblies — the working barrel, suction manifold, discharge manifold and stuffing box.

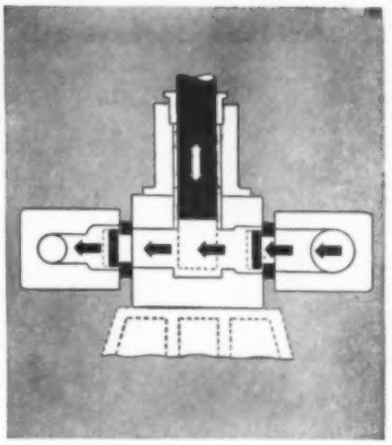
SPEED IN MAINTENANCE is assured because of ease of accessibility of all wearing parts. Manifolds can be slid back on studs and valves removed as complete units. Split collar and flange connection of plunger to yoke permits easy removal of plunger.

ECONOMY OF MAINTENANCE results from speed in maintenance. Perhaps even more important is the simple fact that it is cheaper to replace a single section than a complete fluid-end. Another important economy is parts interchangeability. Among 3-, 5-, 7- and 9-plunger units of any series, wearing parts are interchangeable. Where a combination of multiplex pumps is required, this reduces spare parts stocks.

THE ALDRICH PUMP COMPANY is the originator of the DIRECT FLOW principle — a design innovation that utilizes the sectionalized fluid-end principle. Aldrich Engineers have become known as the people to take your tough pumping problems to. We have never turned down a challenge.

FURTHER INFORMATION can be had direct from the company. Tell us your problem and we'll send you Data Sheets describing the size pump we recommend to solve your problem. Address your request to: The Aldrich Pump Company, 6 Pine Street, Allentown, Pa.

(Advertisement)



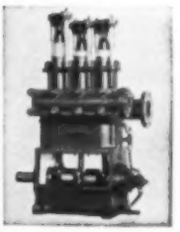
Aldrich Direct Flow Fluid-End Design

...for your tough pumping problems specify ALDRICH

The Direct Flow principle, an Aldrich design innovation, is a major forward step toward the solution of tough pumping problems of all kinds. Not only does it eliminate two right-angle turns in the fluid-end, but in addition makes possible complete Fluid-End Sectionalization. This is another Aldrich design innovation which permits economies of maintenance and repair offered by no other type pump.

CHECK THESE ADVANTAGES OF SECTIONALIZED FLUID-ENDS:

Less expensive parts replacement
Ease of inspection and maintenance
Interchangeable wearing parts
No special equipment for valve removal
Easily accessible stuffing boxes



Write today for Data Sheets describing the Direct Flow Pump Series.

THE ALDRICH PUMP COMPANY

Originators of the Direct Flow Pump
6 PINE STREET
ALLENTOWN, PA.
Representatives in principal cities

W. W. Lowe, vice president and director of Cities Service Petroleum, has been elected president of **Wolverine Pipe Line Company**, succeeding C. S. Gentry, who is retiring. Lowe also is director of Cities Service Refining Corporation and of Cities Service Research and Development Company. He has been associated with Cities Service for more than 40 years. Wolverine is jointly owned by Cities Service, Shell Oil Company and The Texas Company.

W. W. Lowe

•

George V. Myers has been appointed general manager of production for **Standard Oil Company (Indiana)**. Myers will coordinate production and crude oil supply activities of Standard Oil with operations of such principal subsidiaries as Stanolind Oil and Gas Company, Service Pipe Line Company, Stanolind Oil Purchasing Company and Tuloma Gas Products Company. Myers joined Stanolind in 1953.

J. W. Sharman

John Gay

Sharman, Allen, Gay & Taylor, Inc., a new pipe line contracting firm, has been organized in Houston. Principal officers of the company are **J. W. Sharman, John Gay** and **S. A. Taylor,** all formerly with Associated Pipe Line Contractors, Inc. The firm will carry on a general pipe line contracting business, as well as the construction of suspension and rigid type of pipe line bridges.

S. A. Taylor

•

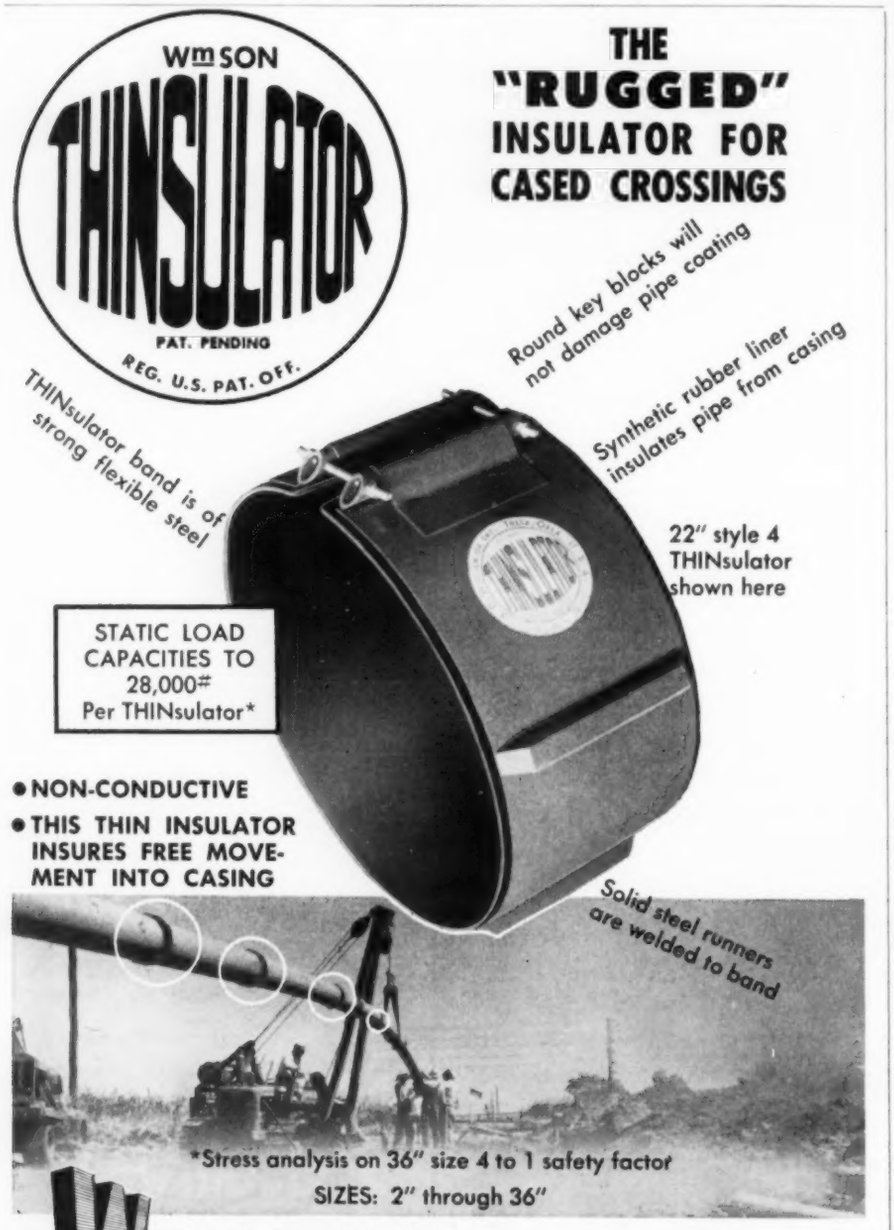
A. A. White, Dean of the University of Houston College of Law since its founding, has resigned to become general counsel for **Texas Gas Corporation** in Houston.

•

Magnolia Pipe Line Company has announced the election of **Joe E. McGeath** to the board of directors. **R. L. Taylor,** assistant to the manager, was named an assistant secretary. McGeath joined Magnolia in 1923 at Smackover, Ark. He served as gager, district superintendent, superintendent of the Southern division, and assistant general superintendent. In 1954 McGeath was named general superintendent.

Joe E. McGeath

Taylor has been with Magnolia since 1923, serving as disbursing agent on various pipe line construction projects, chief clerk, and division chief clerk. In 1943 he moved to Dallas, becoming administrative assistant in the general superintendent's office and was later appointed assistant to the manager.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THINSULATOR
PAT. PENDING
REG. U.S. PAT. OFF.
THE "RUGGED" INSULATOR FOR CASED CROSSINGS
Round key blocks will not damage pipe coating
Synthetic rubber liner insulates pipe from casing
THINsulator band is of strong flexible steel
22" style 4 THINsulator shown here
STATIC LOAD CAPACITIES TO 28,000# Per THINsulator*
• NON-CONDUCTIVE
• THIS THIN INSULATOR INSURES FREE MOVEMENT INTO CASING
Solid steel runners are welded to band
*Stress analysis on 36" size 4 to 1 safety factor
SIZES: 2" through 36"
T.D. Williamson, Inc.
P. O. BOX 4038
TULSA 9, OKLAHOMA
REPRESENTATIVES: Houston • Pittsburgh • Plainfield, N. J. • Amarillo • Casper • Provo, Utah
Joliet, Illinois • Los Angeles • San Francisco • Bartlesville, Okla. • Edmonton • London, Ontario
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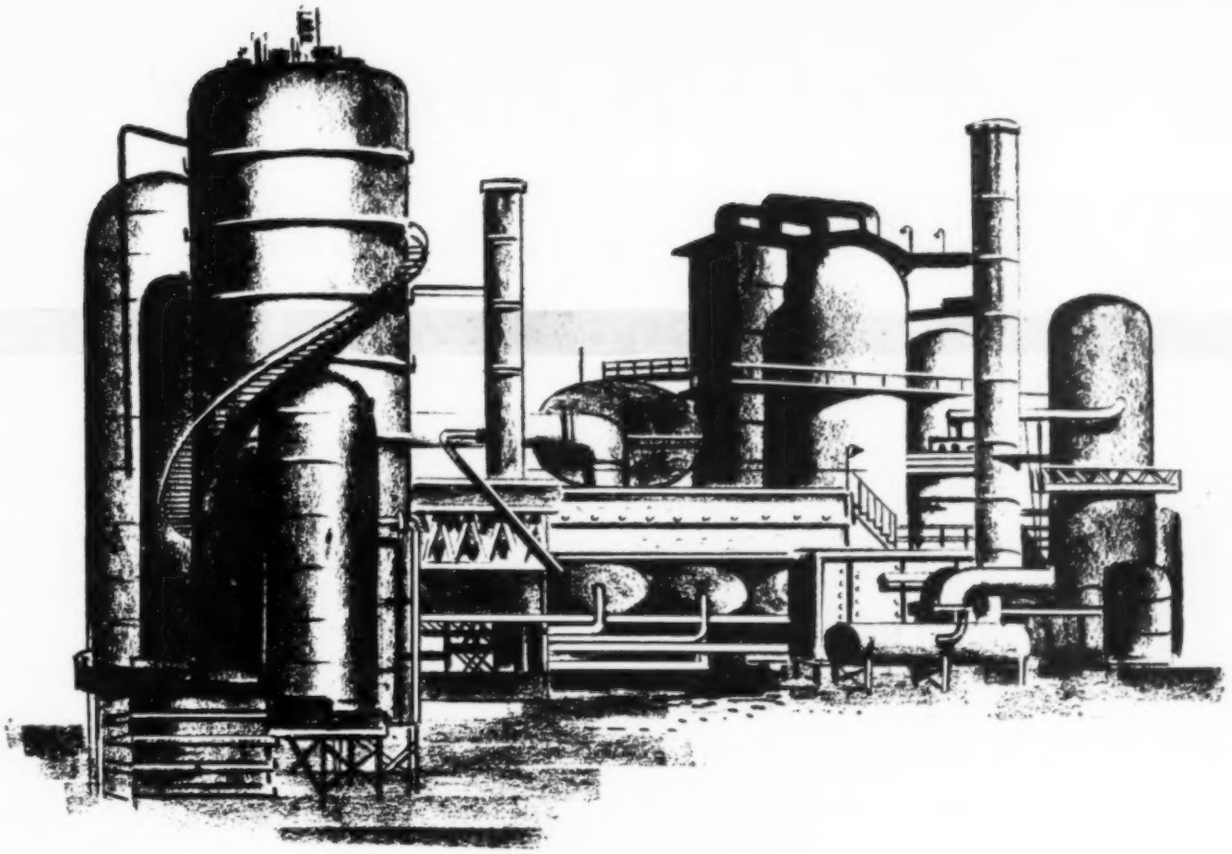
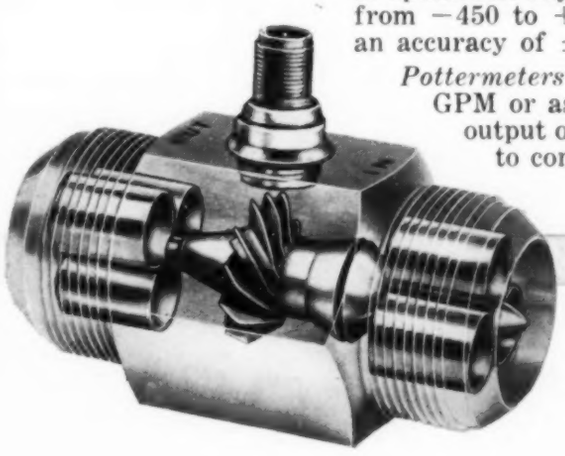


FOR VITAL FLOW CONTROL

WHETHER you're developing a new process or modernizing an old one—investigate the unique characteristics of the bearingless *Pottermeter.*

This electronic flowmeter—easily installed in any type of piping to operate at any angle, at any pressure and at temperatures from −450 to +1200°F, measures flow of any liquid with an accuracy of ±½ of 1%.

Pottermeters are available to measure flows as low as 0.07 GPM or as high as 3,000 GPM. The inherently linear output of the *Pottermeter* makes it ideal for systems to control either flow rate or total flow.



Find out how the bearingless "floating rotor" used in the *Pottermeter* can give you more precise flow measurement, longer trouble-free service life, and more accurate flow control.

Write for Bulletin PS-1

Potter

POTTER AERONAUTICAL COMPANY

Route 22 • Union, New Jersey • Phone MUrdock 6-3010

Makers of "Potter Engineered" products

For more data on advertised products, use Readers' Service Cards, last page.

Bucyrus-Erie Dragshovels

SPEED UP TOUGH PIPELINE TRENCHING

Rough and rocky trenching like this calls for the kind of dependable performance you get from a Bucyrus-Erie dragshovel. This 22-B is working in northern Pennsylvania on a 24-in. natural gas line.

High-output is a traditional characteristic of Bucyrus-Erie dragshovels because of the high hoist speed and extra power on the digging stroke. The cambered boom lets you dig in close to crawlers. The dipper has sloping sides, side cutters with straight edges, and extended lip area for fast digging and heaped loads.

Tractor-type treads have deep grousers for sure traction in soft ground and for climbing steep grades. Added clearance lets you travel over rocks, stumps and other obstacles – 16½ in. on the 15-B, and 20¾ in. on the 22-B. Special sealing protects track-roller bearings against damage from water, dust, dirt and grime.

More and more spreads are demonstrating that it pays to depend on Bucyrus-Erie dragshovels. Your distributor will give you complete details on the ½-yd. 15-B and ¾-yd. 22-B.

235E56

BUCYRUS ERIE

South Milwaukee Wisconsin

Eldon V. Hunt, formerly chief engineer of Alberta Gas Trunk Line Company, Calgary, Alberta, has moved to New York where he has joined **Ebasco Services Inc.** as assistant construction manager in charge of pipe line and related activities.

Eldon V. Hunt

Hunt has been with Ebasco previously as construction superintendent. He managed the engineering and construction of the South Carolina Natural Gas Company line for Ebasco, engineers of the project. Hunt left Ebasco to become general manager of the Key City Gas Company of Dubuque, Iowa, where he supervised the changeover of the gas distribution system from manufactured to natural gas and the construction of additional distribution lines in an expansion of the system. He went to Canada as chief engineer for Alberta Trunk Line in 1954. In 1955 on leave of absence from Alberta, Hunt went to Pakistan as consultant on a river crossing on the Indus river for a gas pipe line being constructed from Sui gas fields to Multan.

During his 20 years in gas and pipe line engineering, Hunt has served with Colorado Interstate Gas Company, Ford, Bacon and Davis Inc., Fish Constructors, and Transcontinental Gas Pipe Line Corporation.

•

Paul E. Nicholls, Jr. has been named market research director of **Gulf Publishing Company,** Houston. Nicholls has been serving as maintenance and design editor of PETROLEUM REFINER. His new position will coordinate the research activities of Gulf's three business papers, which also include WORLD OIL and PIPE LINE INDUSTRY. Nicholls was with M. W. Kellogg, C. F. Braun and General Electric before joining Gulf Publishing. He majored in mechanical engineering at Texas A & M College.

Paul E. Nicholls, Jr.

Walter H. Davidson

F. B. Haverfield

Walter H. Davidson has been named vice president for operations of Transcontinental Gas Pipe Line Corporation and **F. B. (Duck) Haverfield,** now superintendent of compressor stations, will be the new general superintendent. Davidson was vice president and general superintendent of Transcontinental.

Beginning his career with Cities Service Company 31 years ago, Davidson was assistant superintendent of operations for Natural Gas Pipe Line Company of America before joining Fish Constructors in 1949 as general construction superintendent on the Transco project. He became superintendent of operations at Transco in 1950.

Haverfield came to the company

8

SEE US AT THE SHAMROCK MAY 13-16 API CONFERENCE

operating bases assure our customers the best possible pipeline patrol . . . in regular service as well as during emergencies. It'll pay you to investigate the more efficient, less expensive pipeline patrol supplied by gleason romans.

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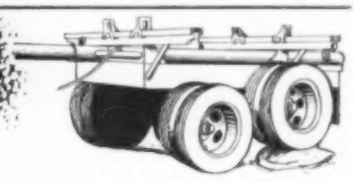
PIPE LINE PATROL CO.
P. O. BOX 8447 • TULSA, OKLAHOMA

PLANE LOCATIONS: TULSA — HOUSTON, MIDLAND, RANGER, EL PASO, TEX. — LAFAYETTE, LA. — LAUREL, MISS. — LIMA, OHIO

CROSS COUNTRY



IN STRIDE

SPENCER-SAFFORD LOADCRAFT PIPELINE TRAILERS

Here is your top-quality pipeline trailer that's really built for cross-country...on or off the highway. Double-pivot tandem for axle equalization and longer tire life. Exclusive hi-tensile, pressed-steel frame permits greater payload. Carrying on the Spencer tradition of quality, the Pipeliner combines lightweight with extreme ruggedness at a moderate price.

Choose among Spencer Oil Field Floats, Pole trailers, low-beds. Available in tandem or single-axle.

Spencer-Safford LOADCRAFT
AUGUSTA, KANSAS

Please send me information on your Pipeliner___ Pole Trailer___ Oil Field Float___

NAME.....

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TOWN.....STATE.....

REDUCE THE CHANCE OF USING THE WRONG VALVE LUBRICANT

ELIMINATE LARGE WAREHOUSE STOCKS

ONLY **4**

DESCO

PLUG VALVE

LUBRICANTS

ARE ALL YOU NEED

no matter what passes thru your valves!

No matter what the fluid or its temperature, Desco Lubricants are guaranteed to STAY in your valves . . . and 4 types are all you need.

Desco Lubricants will not harden or coke-up because they are ALL lubricant and contain no inert material.

CONVENIENT STICKS OR BULK

Packed in clean, convenient sticks in 5 sizes for gun or jack screw. Also in 5-quart, 5-gallon, and 100 lb. bulk containers.

The Only Complete Plug Valve Lubrication Company

DELTA ENGINEERING SALES CO.

539 Aero Drive Shreveport, La.

Sales Offices in All Principal Cities

DELTA-DESCO

PLUG VALVE **LUBRICANTS AND EQUIPMENT**

LUBRICANTS FITTINGS GUNS LUBRICATORS

after 24 years with Continental Oil Company. In 1950 he resigned his position as manager of Conoco's gasoline division to become Transco's superintendent of compressor stations.

•

Jack Leveritt has joined **Northern Natural Gas Company** as a field representative for the Gas Supply department. He also will serve in a similar capacity for Permian Basin Pipeline Company, subsidiary of Northern, and will have headquarters in the Midland, Texas, office of Northern Natural Gas Producing Company, also a subsidiary of Northern.

Jack Leveritt

WHO'S MEETING WHERE

API Safety and Fire Protection Midyear Meeting, Warwick Hotel, Philadelphia, April 30-May 4.

Petroleum Industry Electrical Association, Annual Meeting, Statler-Hilton Hotel, Dallas, May 1-3.

LPG Association Convention and Show, Conrad Hilton, Chicago, May 6-9.

Gas Compressors Institute, University of Kansas and Southwest Kansas Petroleum Industry, Liberal, Kansas, May 7-8.

AGA Distribution, Motor Vehicles and Corrosion Conference, Congress Hotel, Chicago, May 7-10.

American Welding Society, Annual Spring Meeting, Hotel Statler, Buffalo, May 7-11.

AGA Gas Supply, Transmission and Storage Conference, Conrad Hilton Hotel, Chicago, May 10-11.

API Division of Transportation, Shamrock-Hilton, Houston, May 13-16.

Petroleum Electric Power Association, Robert Driscoll Hotel, Corpus Christi, May 14-16.

AGA Chemical Engineering and Manufactured Gas Production Conference, Benjamin Franklin Hotel, Philadelphia, May 16-18.

Pennsylvania Gas Association, Pocono Manor Inn, Pocono Manor, Penn., May 22-24.

Natural Gas & Petroleum Association of Canada, Sheraton Brock Hotel, Niagara Falls, Ont., Canada, May 24-25.

Kentucky Oil & Gas Association, Annual Meeting, Lafayette Hotel, Lexington, Ky., May 24-25.

Eleventh Annual Short Course in Gas Technology, Texas College of Arts and Sciences, Kingsville, Texas, May 30-June 1.

Canadian Gas Association, Manoir Richelieu, Murray Bay, Quebec, June 24-27.

Michigan Gas Association, Grand Hotel, Mackinac Island, Mich., June 25-26.

Pacific Coast Gas Association, Annual Meeting, Coronado, Calif., Sept. 11-13.

Mid-Continent Oil & Gas Assoc., Louisiana-Arkansas Division, Annual Membership Meeting, Roosevelt Hotel, New Orleans, Sept. 20-21.

American Society of Mechanical Engineers, Petroleum Mechanical Engineering Conference, Statler-Hilton, Dallas, Sept. 23-26.

International Gas Union, Sixth Annual Conference, Hotel New Yorker, New York City, Sept. 25-30.

Texas Mid-Continent Oil & Gas Association, Rice Hotel, Houston, Oct. 2-3.

AGA Annual Meeting, Atlantic City, N. J., Oct. 15-17.

Rocky Mountain Oil & Gas Association, Annual Convention, Cosmopolitan Hotel, Denver, Oct. 22-24.

American Petroleum Institute, Annual Convention, Conrad Hilton Hotel, Chicago, Nov. 12-15.

American Society of Mechanical Engineers, Statler Hotel, New York, Nov. 25-30.

Petroleum Equipment Suppliers Association, Palm Springs, Calif., April 6-11, 1957.

NOTICE: Specify **PELCO** Welding Saddles

No change except the corporate name. We still have the same ownership, same management, same address, same telephone, and use the same 45 years of experience to render the same service under the same trade name—"PELCO."

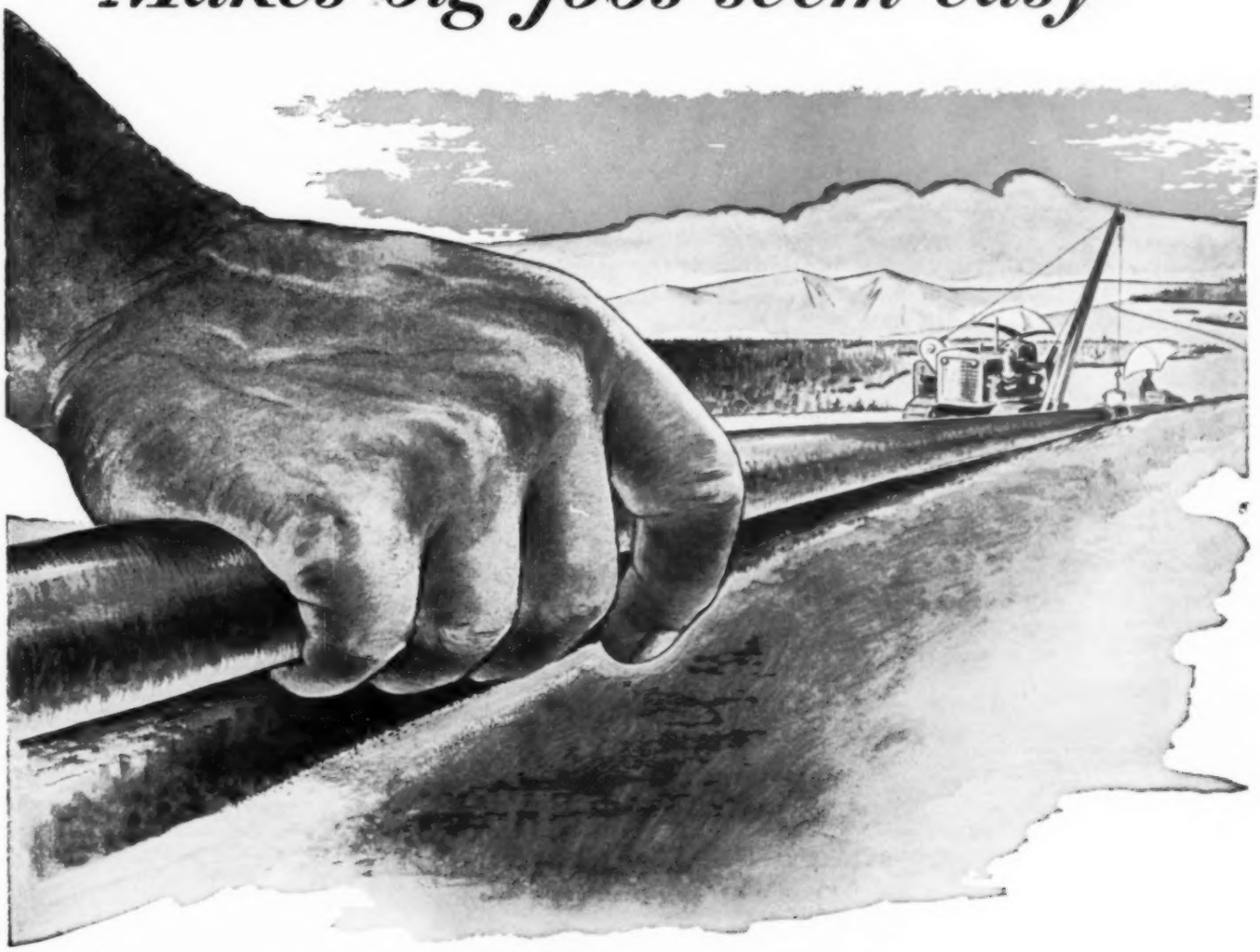
PELICAN SUPPLY CO. INC.

P. O. Drawer 1108 Shreveport (84), La.

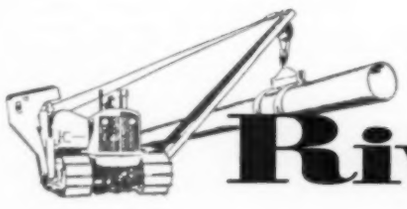
SEE YOUR NEAREST SUPPLY HOUSE

River

Makes big jobs seem easy



It takes planning, equipment and trained crews to complete pipeline contracts ahead of schedule. It takes the experience gained in the thousands of miles of pipeline that River has finished to overcome the obstacles of terrain and weather and come out ahead. Put River Construction to work on your next contract and watch the job completed... to your satisfaction — *on time!* River is just the right size... big enough to handle any job... small enough to give your contract the personal attention it deserves.



River CONSTRUCTION CORPORATION

ROBERT THOMAS
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GENERAL OFFICES: 4837 WEST FREEWAY, P. O. BOX 9127, FORT WORTH, TEXAS

For more data on advertised products, use Readers' Service Cards, last page.

What's Happening

AMONG SERVICE AND SUPPLY MEN

Radiator Specialty Company Names Texas Representative

Phil Douglas, representing Radiator Specialty Company, is now making calls on all Texas oil producing headquarters introducing two products used in oil field, pipe line and other production operations.

Phil Douglas

TITESEAL, available in different blends, is the gasket and joint sealing compound designed for use in oil field operations, natural gas fields, LPG, refrigeration, railroads, automotive and industrial plants wherever loss or danger due to leaks must be avoided. LIQUID WRENCH is a rust solvent used along the Gulf Coast where salt water creates rust and corrosion problems.

Worthington Acquires Mason-Neilan Division

Hobart C. Ramsey, chairman of Worthington Corporation, and Eldon Macleod, president of Mason-Neilan Regulator Company of Boston, have announced an agreement for the transfer of the net assets, name and goodwill of Mason-Neilan to Worthington in exchange for Worthington common stock.

Mason-Neilan plant and facilities will be operated as the Mason-Neilan division of Worthington and the staff will continue in present positions. The full line of Mason-Neilan products will continue to be manufactured, including instruments and valves designed to control the pressure, temperature and flow of the liquids, gases and components incident to industrial processes. Among them are indicating, controlling and recording instruments, flow meters, diaphragm control valves, servo-motors, pressure regulators, pump governors, filters and other specialties.

General Electric Promotes Glover to Post as Specialist

Appointment of Kenneth E. Glover as supecialist—operations research and synthesis for the Distribution Assemblies department of the General Electric Company has been announced.

Glover joined the General Electric Company in 1950 as a design engineer. In 1952 he was appointed manager of the department's plant at Houston. The following year, he became plant manager of the department's plant at North Hollywood, Calif. Glover will make his headquarters at Plainville, Conn.

Pipe Line Manufacturers Attend Course

A group of T. D. Williamson, Inc. representatives inspect the latest model of WmSon-Hillco tapping machines while attending a refresher course at the Tulsa offices which are held periodically for Williamson representatives. Standing, left to right, are Tod Pazdral, Jim Ford and Dick McHenry, all of Tod Pazdral Pipeline Specialties (TOPAZ) Houston; Don Corp, factory engineer; Ken Cusick, James S. Kone & Co., Amarillo; Fred Crandall, research engineer, and T. D. Williamson, president. Kneeling are Jack Stout, Canadian Equipment Sales and Service Co., Ltd., Edmonton, Alberta; Jack Duke and Jack Pelkey, of TOPAZ, Houston.

Petroleum Equipment Suppliers Announce 1957 Officers, Plans

The Petroleum Equipment Suppliers' Association will hold its 1957 meeting at Palm Springs, Calif., April 6 to 11.

This plan was announced April 18 at PESA's 21st annual meeting in Boca Raton, Fla.

Officers of PESA for 1956-1957 were elected at the meeting. Rainey Elliott, of Jones & Laughlin Steel Corporation, Supply Division, Tulsa, was elected president. Grover Kilgore, Halliburton Oil Well Cementing Company, Duncan, Okla., was chosen vice president. Wharton Weems, of Vinson, Elkins, Weems & Searls, attorneys, Houston, was named treasurer. H. R. Safford, Jr., Houston, was reelected executive secretary.

Directors of PESA for 1956-1957 were announced at the Florida meeting.

For the Eastern district, Fred J. Spang, Spang & Company, Butler, Penn., was chosen director emeritus. Mason B. Jones, The S. M. Jones Company, Toledo, will be director at large.

Other directors are as follows: Karl Elliott, Acme Fishing Tool Company; Rainey Elliott, Jones & Laughlin Steel Corporation; Jene Harper, Franklin Supply Company; Lloyd Lamphere, Ajax Iron Works; Donald W. Mackie, Jr., Bradford Supply Company; Frederick F. Murray, Oil Well Supply Division, U. S. Steel Corporation; and A. W. McKinney, National Supply Company.

Also, J. B. O'Connor, Ideco Division of Dresser Equipment Company; Paul Scherf, Alten Foundry & Machine Works, Inc.; John G. Seiler, Tube Turns, Division of National Cylinder Gas Company; H. Bernard Wehrle, McJunkin Corporation; and W. A. Wood, Parkersburg Rig & Reel Company.

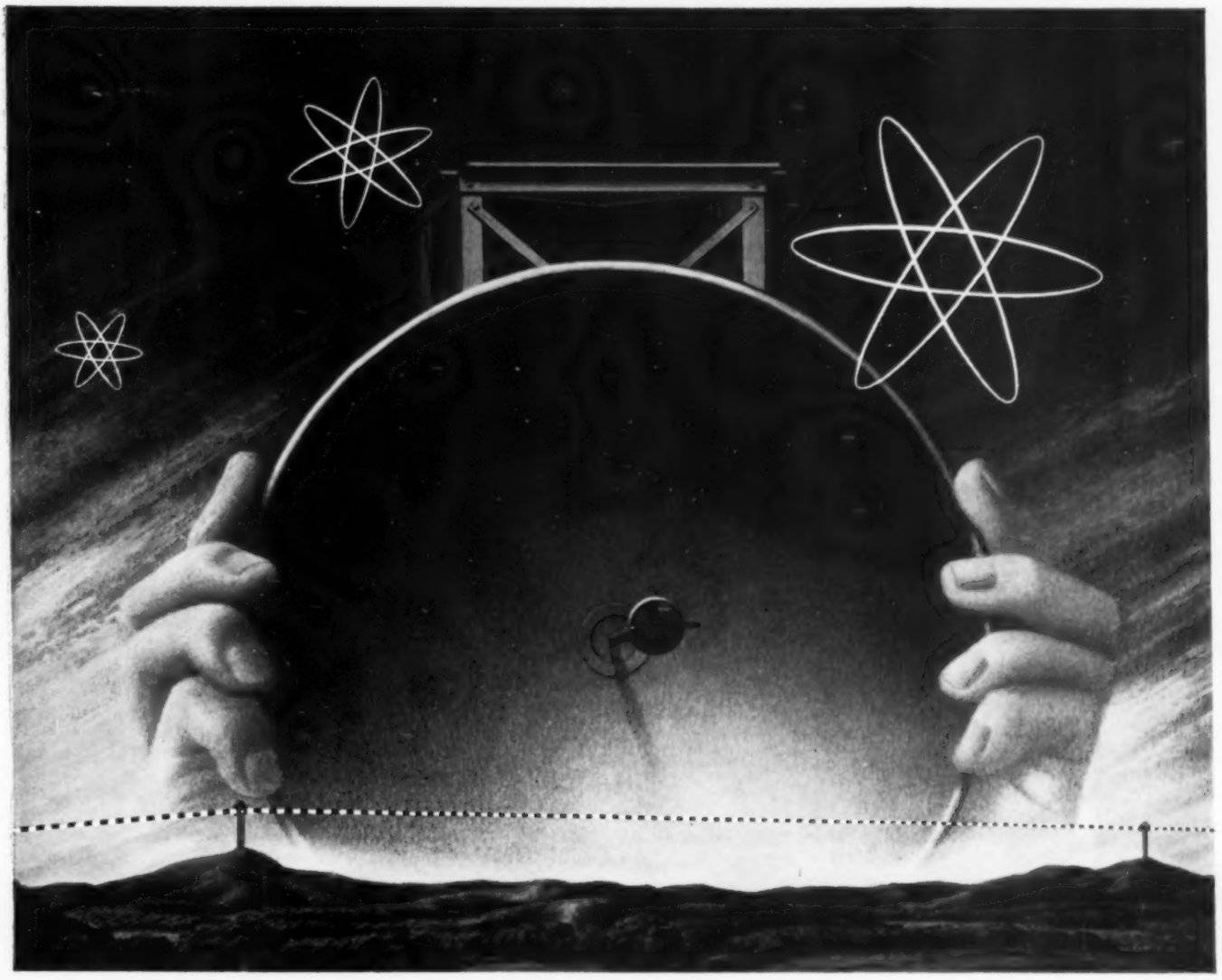
For the Mid-Continent & Rocky Mountain district, Guy A. Tompson, Bethlehem Supply Company, Tulsa, was named director at large. Other directors for 1956-1957 will include: R. A. Baker, Franks Manufacturing Corporation; F. E. Bernsen, Lucey Products Corporation; E. C. Bolger, W. C. Norris, Manufacturer; Davis D. Bovaird, Bovaird Supply Company; Paul Courtney, George E. Failing Company; and Grover Kilgore, Halliburton Oil Well Cementing Company.

Also, W. H. Larkin, Larkin Packer Company; M. G. McCool, American Iron & Machine Works Company; Walter O'Bannon, Jr., Walter O'Bannon Company; John G. Staudt, Dowell Incorporated; S. P. Wallace, Maloney-Crawford Tank & Manufacturing Company; and J. E. Webb, Republic Supply Company.

For the Southwestern district, directors at large will include Fred M. Mayer, Continental Supply Company, Dallas; M. E. Montrose, Hughes Tool Company, Houston; and Wallace D. Wilson, Wilson Supply Company, Houston.

Other directors are as follows: H. H. Allen, Cameron Iron Works; Richard E.

FEDERAL MICROWAVE—"CERTIFIED BY A WORLD OF RESEARCH"



Before buying microwave today... look at tomorrow!

What new types of applications will industry expect of microwave communication in the years ahead?

This is a vital question for microwave buyers in this electronic and atomic age, when science, industry, and communication are moving forward so rapidly. Before the final decision is made there should be assurance that microwave techniques will keep in step... always be ready to *interwork with progress!*

With *Federal* Microwave this assurance is an inherent part of the system... and to a unique degree. Working constantly in laboratories and microwave factories in many countries are hundreds of scientists and engineers of International Telephone and Telegraph Corporation... finding new applications for microwave... advancing the capabilities and performance of associated equipment, such as telephone, carrier, and VHF mobile radio.

IT&T's never-ending activity provides the greatest possible protection for today's microwave investment... the finest assurance that the applications of tomorrow will be met by *Federal* Microwave... the system whose future is *"Certified by a World of Research!"*

Federal

A DIVISION OF IT&T

Federal Telephone and Radio Company

A Division of INTERNATIONAL TELEPHONE AND TELEGRAPH CORPORATION

100 KINGSLAND ROAD • CLIFTON, NEW JERSEY

In Canada: Standard Telephones and Cables Mfg. Co. (Canada) Ltd., Montreal, P. Q.
Export Distributors: International Standard Electric Corp., 67 Broad St., New York

For more data on advertised products, use Readers' Service Cards, last page.

For effective, long-term protection against corrosion . . .

Close-up of Transhield Asbestos Pipe Line Felt, showing parallel-spaced glass yarns.

Coating and wrapping pipe line to check corrosion and assure long-term service.

. . . use Johns-Manville TRANSHIELD® ASBESTOS PIPE LINE FELT

Johns-Manville Transhield is an economical pipe line felt assuring effective, long-term protection against corrosion under average soil conditions.

Designed for easy, high-speed application by modern machine methods, Transhield is strong and highly tear-resistant. Its light weight permits its use in 800-ft. rolls. This advantage cuts roll changes in half for field wrapping equipment.

Transhield provides a protective membrane of coal-tar saturated asbestos felt, reinforced with continuous glass yarns parallel-spaced on ¼" centers. It cannot rot or decay, thus acts as an enduring barrier to shield pipe line enamels from earth loads and soil stress.

For severe soil conditions use Johns-Manville #15 Asbestos Pipe Line felt . . . proven in service for over 30 years.

For further information about Transhield, write to Johns-Manville, Box 60, New York 16, N. Y. In Canada, 565 Lakeshore Road East, Port Credit, Ont.

JOHNS-MANVILLE JM PRODUCTS

Johns-Manville PRODUCTS FOR PIPE LINE PROTECTION

White, Mission Manufacturing Company; Ken W. Davis, Mid-Continent Supply Company; R. G. Hamaker, Reed Roller Bit Company; Ott Hammer, Security Engineering Division, Dresser Operations; and Frank L. Hereford, Murray-Brooks, Inc.

Also, S. J. Iverson, Iverson Supply Company; Elliott Johnson, Schlumberger Well Surveying Corporation; L. A. Little, Lufkin Foundry & Machine Company; George O'Leary, Houston Oil Field Material Company; H. C. Otis, Otis Pressure Control, Inc.; and Ray O. Shaffer, Welex Jet Services.

For the Pacific district, D. S. Faulkner, National Supply Company of California, Torrance, was named director emeritus. Directors at large are: J. A. Crawford, Youngstown Steel Products Company; E. S. Dulin, Byron Jackson Company; and T. Sutter, Baker Oil Tools, Inc. All are of Los Angeles.

Other directors include: J. L. Evans, National Supply Company of California; W. W. Greenway, Axelson Manufacturing Company; Don Grubbs, Oil Well Supply Division, U. S. Steel Corporation; H. J. Hagn, Chiksan Company; T. J. Hickey, Hickey Pipe & Supply Company; Harold E. Howard, Howard Supply Company; and Wendell Jones, Bethlehem Supply Company.

Also, John J. Neale, Lane-Wells Company; H. H. Peters, Technical Oil Tool Corporation; John J. Pike, Republic Supply Company of California; W. T. Powell, Emsco Manufacturing Company; and W. A. Wilson, Web Wilson Oil Tools, Inc.

Stempf Named to New Post With Worthington Corporation

C. R. Stempf has been appointed manager of the newly-created Standard Products section of Worthington Corporation's Export department. Stempf formerly was the corporation's special representative in Madrid, Spain.

C. R. Stempf

Stempf joined Worthington in 1946 as an estimator in the Springfield, Mass. branch. He was transferred to the Washington, D. C., district office as sales engineer in 1948 and named special representative to Madrid in 1954.

U. S. Steel Appoints Beasley Representative

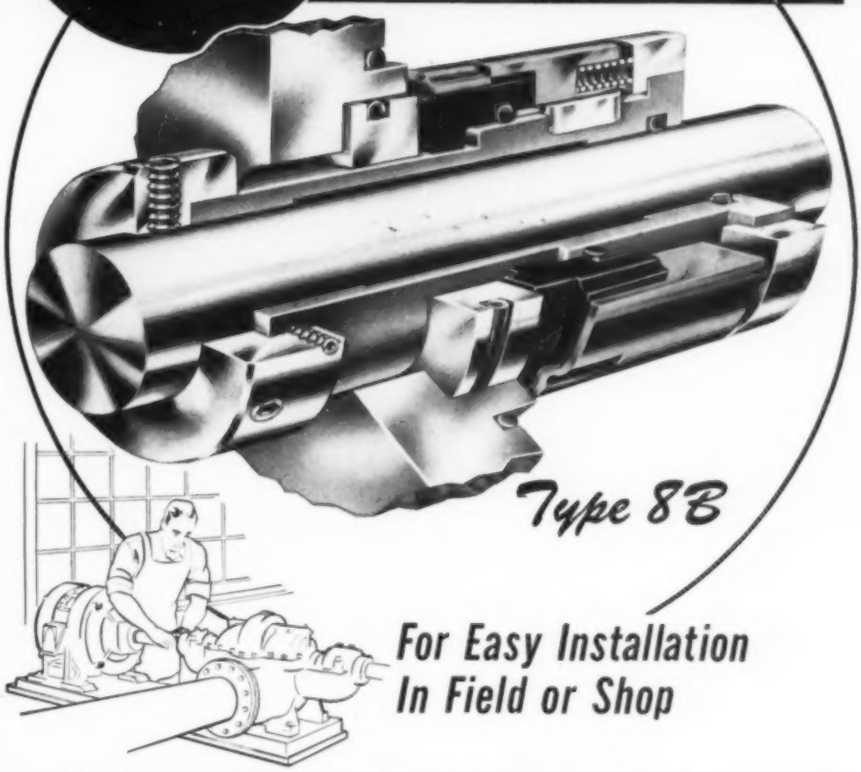
Ralph T. Beasley has been appointed district product representative for alloy, stainless and tubing sales for the U. S. Steel Supply Division of U. S. Steel. Beasley has been transferred to his new assignment from San Antonio, Texas, where he was sales representative for the Supply Division. He will have headquarters in Houston.

Ralph T. Beasley

Beasley has been associated with U. S. Steel Supply since January, 1953, serving in a general sales capacity in the Houston district.

JOHN CRANE

PACKAGED TYPE MECHANICAL SEALS FOR High Pressure Pipe Line Pumps



For Easy Installation In Field or Shop

Manufacturers of large centrifugal pumps and pipe line operating engineers have long been asking for an end face mechanical seal meeting these requirements: 1) heavy-duty design to handle high pressure applications; 2) single-unit packaged construction for easy installation; 3) a full range of sizes to meet individual specifications.

"John Crane" has met this need with the Type 8B hydraulically balanced seals for pressures to 1200 psi.

These seals can be quickly installed and adjusted simply by sliding the entire unit along the shaft into final position. Removal of the top casing is not necessary. This feature alone results in the saving of many man-hours of maintenance work.

Field reports and performance records point to the steadily increasing use of "John Crane" high pressure seals to eliminate problems connected with the handling of hydrocarbons, crudes, gasoline and other petroleum products.

To help you in your individual requirements, "John Crane" offers nationwide service—available without obligation from strategically located factory owned branch offices.

Write for illustrated high pressure seal bulletin.

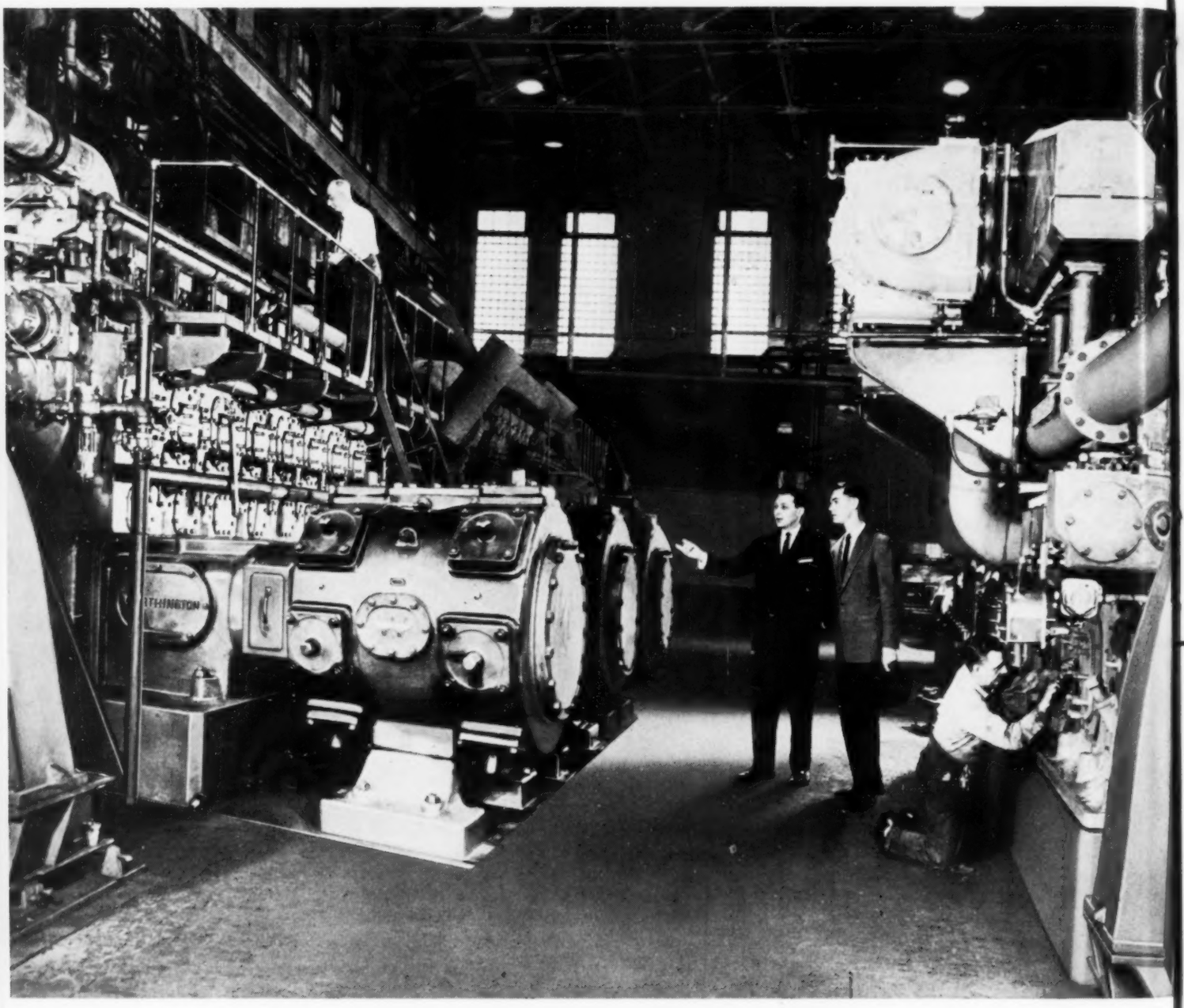
Crane Packing Co., 6434 Oakton St., Morton Grove, Ill., (Chicago Suburb).

In Canada: Crane Packing Co., Ltd., 617 Parkdale Ave., N., Hamilton, Ont.

JOHN CRANE CRANE PACKING COMPANY

For more data on advertised products, use Readers' Service Cards, last page.

First 2-cycle pipeline compressor with



Progressive engineering gives you more for your engine compressor dollar in the TURBO-UNIFLO

AFTERCOOLING FOR MAXIMUM LOAD CAPACITY. Air inlet manifold temperatures must be kept reasonably low to maintain wide engine operational range and overload capacity. This is important in high ambient temperature locations. Low cycle temperatures reduce maintenance on liners, heads, and pistons. Individual aftercoolers mounted immediately adjacent each cylinder inlet give maximum load capacity with accessibility.

MORE POWER FROM TURBO-UNIFLO DESIGN. Only cam-operated, timed exhaust valves permit early opening of exhaust to give complete evacuation of burnt gases, and controlled closing for trapping maximum supercharging air. Coupled with pulse-generator ignition, this quiet chain driven timing system gives top performance with minimum maintenance.

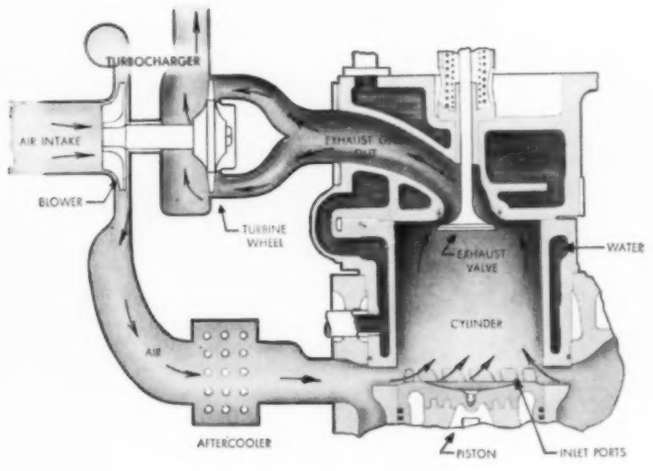
The only turbocharged 2-cycle engine-compressor with

exhaust-powered turbocharging at all loads

NO POWER-DRAINING EXTRA-DRIVE FOR SUPERCHARGING WITH THE "TURBO-UNIFLO"— WORTHINGTON'S SUTC GAS-ENGINE COMPRESSOR

In its first production year this unique two-cycle turbocharged gas-engine-compressor (750 to 2500 hp) has had remarkable acceptance. Designed for quiet exhaust powered pulse-type turbocharging, on the basis of Worthington's extensive two-cycle engine-compressor experience, more than twenty-four TURBO-UNIFLO SUTC's are either installed or on order. Built to lead the field for years to come, they're industry's best for gas pipeline applications.

By integrating exhaust powered turbocharging with field proven Worthington Uniflo scavenging design, Worthington engineers have developed a two-cycle engine-compressor unequalled for stability of performance over the *complete* range of speed and load requirements. Operating at relatively high compression ratio, the TURBO-UNIFLO has much smoother combustion characteristics than other engines with lower compression ratios. This is due to the basic timing arrangement, engine configuration, and design of exhaust manifolding. Sufficient exhaust gas energy is applied at the turbocharger, from engine start-up through all speeds and loads, to give full turbocharged effect without added external mechanical means for driving the supercharger. Low fuel and lube oil consumptions are other important results of this design arrangement.



TURBO-UNIFLO OPERATION — Exhaust valves are timed to open and generate a pressure pulse to move the turbine blades. This gives self-sustained starting and quick acceleration without external aid or mechanical drive. Blower delivers air under pressure to the aftercooler. Cooled air enters the cylinders through inlet ports 360° around the liner. During the scavenging period, the combustion chamber walls and valves are effectively cooled.

The Uniflo system is accepted as having highest scavenging efficiency. It also gives the best turbocharging-scavenge ratio due to complete absence of residual gases in the combustion chamber.

QUIETER OPERATION. Cast-iron exhaust manifolding—dry insulated, built-in air-pulse dampener, triple-strand silent camshaft chain, hydraulic valve lifters and elimination of any mechanically-driven air charging device assure quietness.

FEATHER VALVE. The feather valve is standard TURBO-UNIFLO equipment. It's the lightest, simplest and quietest valve—and operates with no impact!

For more details on the TURBO-UNIFLO, call your nearest Worthington District Office, or write Section E63, Worthington Corporation, Harrison, New Jersey. E-6.3

WORTHINGTON

exhaust-powered turbocharging from start-up through full-load

The new 12-acre plant of W-K-M Manufacturing Company, Inc., at Missouri City, Texas, is designed to permit three distinct product production facilities to function under one roof, the manufacturing plant alone covering almost 11 acres at ground level. Offices occupy 1200 square feet on the second floor of the steel frame building; offices, engineering space, reception and conference rooms occupy the remaining 48,000 square feet of floor space of the lower floor. The plant has a 2250-ton air conditioning system which converts to winter time heating.

ARCCO
NOW SPECIFIC GRAVITY RECORDING OF LIQUIDS AT ANY DISTANCE
RECORDING TRANSMITTER
Accurate long-distance transmission of specific gravity recordings is no longer a problem with any of the new RMT Models of Arcco-Anubis Recording Gravitometers for recording and transmitting liquid gravity records. These instruments combine the mechanism of the standard Arcco Liquid Gravitometer with a metameter telemeter transmission system which records and transmits the specific gravity record to control room or other remote location. The interconnecting line may be any two-wire electrical circuit or its equivalent: private wires, telephone circuits, carrier current channels, or radio (VHF or UHF).
The range of the standard instrument is .15 or larger, but instruments with ranges of .10 or .05 can be supplied. Charts are available for more than 75 different ranges of Specific Gravity or Degree A.P.I. Special ranges can be furnished at slight additional cost. Request Bulletin No. 111-R3 for complete details.
RECORDING RECEIVER
AMERICAN
RECORDING CHART CO.
3113 E. 11th St. • Los Angeles 23, Calif.
SEND FOR BULLETIN No. 111R-3

W-K-M Opens New Plant, Announces Consolidation

A new W-K-M Manufacturing Company will come into being May 17, along with the opening of its new 12-acre plant on a 75-acre site at Missouri City, a few miles southwest of Houston.

J. S. Downs

It will be a consolidation of W-K-M Manufacturing Company, Houston, a subsidiary of ACF Industries, Inc., manufacturer of gate valves for oil production and pipe line installation; The Key Company, East St. Louis, manufacturer of return bends and fittings for oil refining and chemical processing; and the ACF Valve Division, Detroit, producer of lubricated plug valves for all industrial pipe line uses.

All activities of the three concerns will be conducted in the new plant on Highway 90-A and the main line of the Southern Pacific system. This plant has been designed so that each will function as a distinct manufacturing opration with individual production lines for each product.

Machinery from the former W-K-M plant in Houston, from the Key plant in East St. Louis and the ACF Detroit plant is being set up along with new equipment necessary for the expansion involved in the consolidated operation.

J. S. Downs, president of W-K-M Manufacturing Company, will continue to head the expanded organization. Management and other key personnel from both East St. Louis and from Detroit are being transferred to Houston so all standards of operation can be maintained.

The new organization is to be known as W-K-M Manufacturing Company, Inc., a subsidiary of ACF Industries, Inc.

Jack Duke Joins Staff Of Tod Pazdral in Houston

Jack L. Duke has joined Tod Pazdral Pipeline Specialties in Houston as sales and service engineer in South Texas, South Louisiana and South Mississippi.

Jack L. Duke

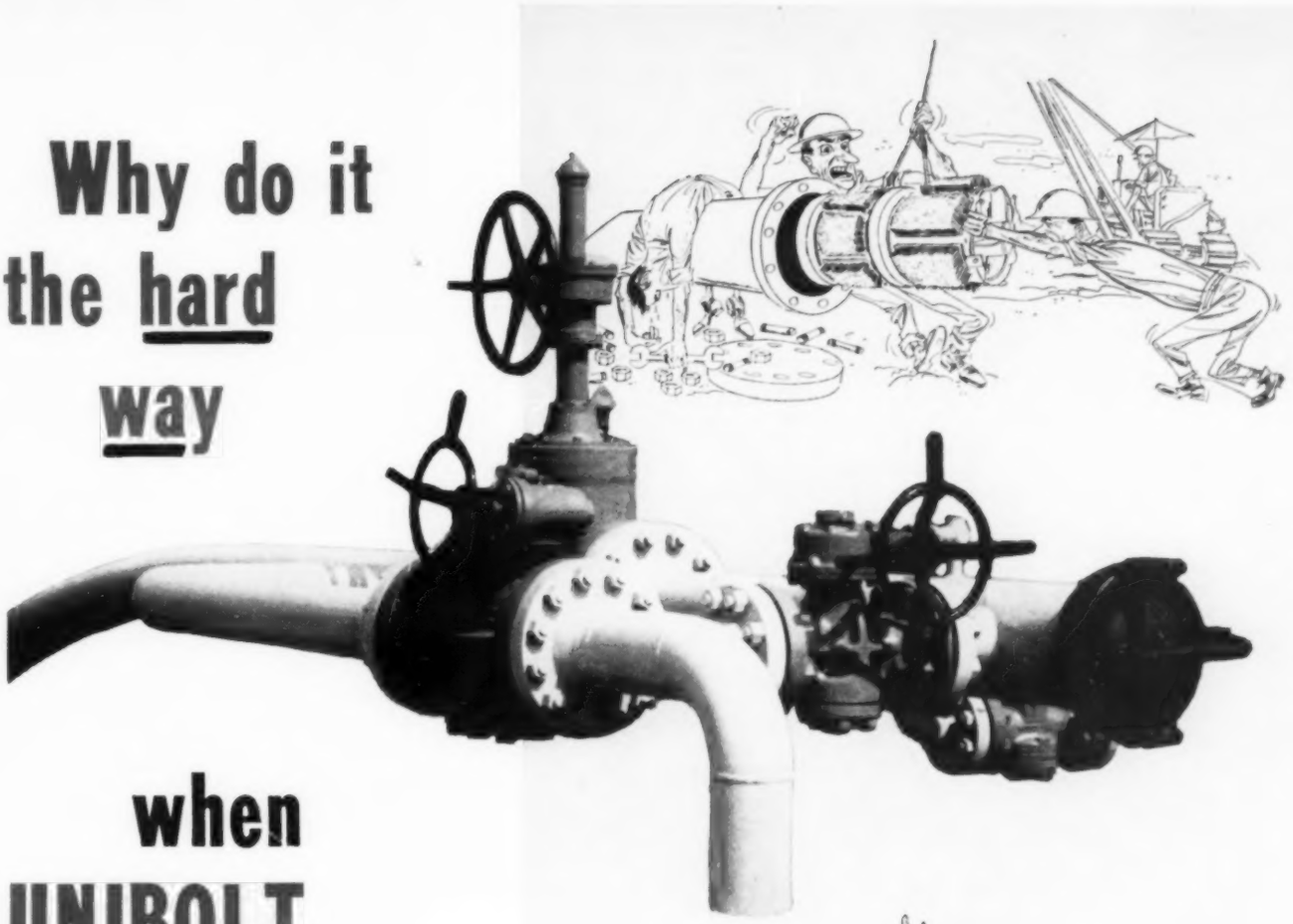
Duke has seven years of field and engineering experience with utility and transmission companies in addition to his degree in petroleum and natural gas engineering.

Caterpillar Tractor Opens New Plant at Decatur, Ill.

Opening ceremonies for Caterpillar Tractor Company's new wheel tractor and motor grader manufacturing plant at Decatur, Ill., have been set for May 21. Open house will be held through May 25.

The new plant was built to free Caterpillar's Peoria, Ill., facilities for full production of diesel engines and crawler tractors. It is the fifth new plant in the company's postwar expansion.

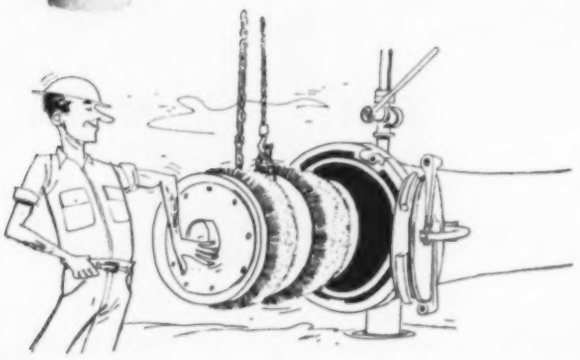
Why do it the hard way



when UNIBOLT Scraper Traps

(with oversize barrel)

make pigging so easy!



Unibolt Scraper Trap Closures are the most convenient, most practical means for blanking off a line so that pigs may be easily inserted and removed from the trap. The scraper barrel being slightly larger than the pipe itself, the pig is easily inserted or removed. It is no longer necessary to "fight" the pig in and out of the trap. Release two bolts and the blanking plug swings open on a sturdy hinge. Swing the trap shut, tighten the bolts, and that's all. Let the pumps do the hard work. No heavy blind flanges to lift on or off. No multiple bolts to release and make up. Nothing to fall on the workmen. No leaky threads. An oil-resistant gasket seals automatically . . . seldom needs replacing.

THORNHILL CRAVER CO.

P. O. BOX 1184 HOUSTON, TEXAS

Ray Long

George W. Noyes

Vapor Recovery Systems Promotes Long and Noyes

Ray Long has been promoted by The Vapor Recovery Systems Company from the Sales department at the factory to district manager of the Gulf Coast states area with headquarters in Houston, Texas. The company is establishing a factory branch office to serve this territory.

George W. Noyes of Houston will assist Long in sales engineering and service. He has served on the engineering staffs of Humble Pipe Line Company, Fluor Corporation and Brown & Root.

Oil Well Supply Division Names Field Representatives

U. S. Steel's Oil Well Supply division has announced the appointment of Luther C. Whalin, M. L. Childress, and Jack T. Cline as field representatives.

Whalin, employed by Oilwell since 1949, is now field representative at Sundown, Texas, Childress is representative at Carmi, Ill., and Cline at Lindsay, Okla.

Arthur L. Reese

Eugene S. Goebel

Motorola Expands Sales; Names 6 Vice Presidents

Motorola Communications and Electronics, Inc., has announced a major expansion of the national sales structure which resulted in establishing four geographical sales divisions and appointing six vice presidents.

Arthur L. Reese, formerly assistant secretary, has been appointed vice president and operations manager and Eugene S. Goebel, formerly national sales manager, was named vice president for market relations with duties to include public and customer relations and other special staff assignments.

Four former regional managers in the field were appointed vice presidents and placed in charge of new sales divisions. These include Lowell E. White, vice president and Eastern sales division manager; Homer L. Marrs, vice president and Central sales division manager; Edward L. Falls, Jr., vice president and Southern sales division manager; and Donald F. Brickley, vice president and Western sales division manager.

The new Eastern sales division covers a 15-state coastal area including the Carolinas, the Virginias, Pennsylvania, New York and all of New England with headquarters in Fort Lee, N. J. Central sales division headquarters in Chicago serves a 13-state area, including the Dakotas through Ohio and everything north of Oklahoma-Arkansas-Tennessee borders.

Southern sales division covers the ten-state area of New Mexico, Texas, Oklahoma, Arkansas, Louisiana, Tennessee, Mississippi, Alabama, Georgia and Florida with headquarters in Dallas. San Mateo, Calif., will be headquarters for the manager of the Western sales division, covering Arizona, Colorado, Wyoming and Montana through to the coastal states.

GEARED

WISCONSIN Air-Cooled Heavy Duty ENGINES

HARLEY SALES CO.

THE OIL INDUSTRY

YEARS of experience in the manufacture of internal combustion engines, fortified by our concentrated knowledge of the intricate problems of the oil industry, permits us to offer engines and specially fabricated units which answer economically, practically and dependably the most perplexing oilfield questions in the power range of 3 to 36 H.P.

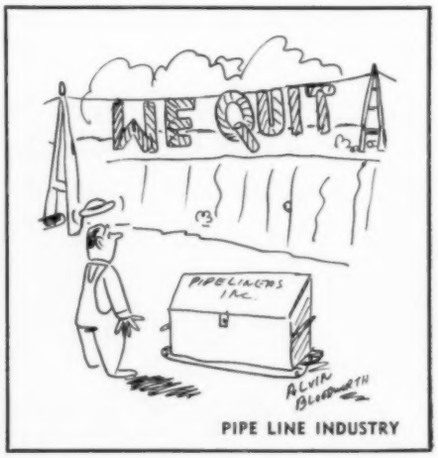
Service parts readily available in all oil fields

WE SOLICIT YOUR INQUIRIES

HARLEY SALES CO.

Oil Industry Distributor
Wisconsin Air-Cooled Heavy Duty Engines

HOUSTON TULSA WICHITA



PIPE LINE INDUSTRY

Transcontinental pipelines are among the many places where Cathodic Protection and Anaconda Type CP Cable are used to check corrosion.

Cable that helps make the pipeline a good neighbor

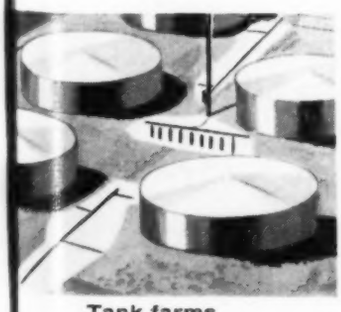
To make cathodic protection systems more economical and effective – to help pipeline and oil companies check costly corrosion, stop leaks, make pipelines good neighbors – Anaconda offers a special Type CP Cable that *lasts far longer* on the job than ordinary cable.

High-grade polyethylene insulation and tough Densheath* (PVC) jacket offer high resistance to electroendosmosis†, as well as high resistance to oil, moisture, and most acids, alkalies and chemicals found in corrosive areas. And rugged Densheath withstands toughest abrasion, moisture and weathering.

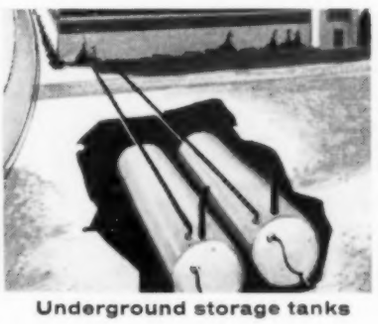
To order, or for more information—call the Man from Anaconda. Or write: Anaconda Wire & Cable Company, 25 Broadway, New York 4, N.Y.

†Cable failure on direct current in wet locations 56357
*Reg. U.S. Pat. Office

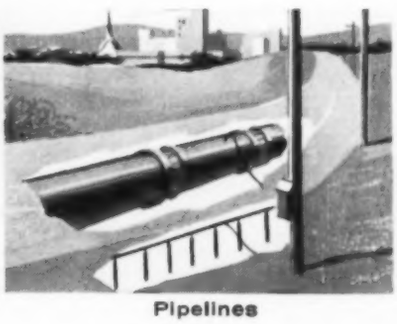
WHERE ANACONDA TYPE CP CABLE AND CATHODIC PROTECTION CUT CORROSION COSTS



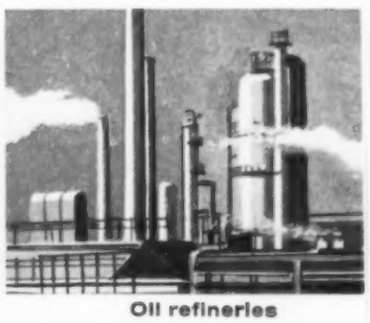
Tank farms



Underground storage tanks



Pipelines



Oil refineries

ASK THE MAN FROM ANACONDA®
FOR CATHODIC PROTECTION CABLE

Save with

Instant Acting

SABANOL

THE HOMOGENIZING FUEL OIL TREATMENT

Prominent Pipe Line User Says

"THE USE OF SABANOL HAS JUST ABOUT ELIMINATED NOZZLE TROUBLE. SABANOL PREVENTS THE CARBON FROM BUILDING UP ON NOZZLE TIPS, PREVENTS THE STICKY CARBON FORMATION IN PLUNGER CYLINDER AND PREVENTS ENGINE DETONATION; SAVES CRITICAL DOWN TIME."

Why don't you make a Sabanol Savings test with just one five gallon can $15.00 fob Freeport? Also in 55 gal. drums.

Stocked by Leading Supply Houses
GULF COAST DISTRICT REPRESENTATIVES
Western Sand-Banum Company
705 M & M Bldg., Houston 2, Texas
Colloid Products Co.
2825 Storey Lane, Dallas, Texas

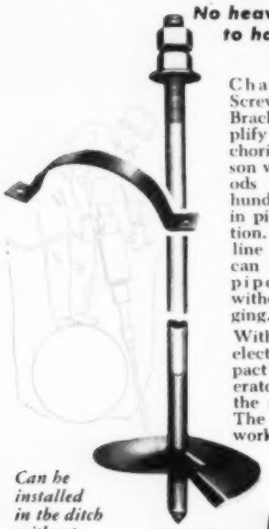
AMERICAN SAND-BANUM CO.
ESTABLISHED 1926
MEADOW BROOK NATIONAL BANK BUILDING
FREEPORT, NEW YORK

Here's the Fast Easy Way to Anchor Pipelines

No heavy equipment to haul. Cuts costs to a fraction.

Chance Pipeline Screw Anchors and Brackets greatly simplify pipeline anchoring in comparison with other methods and they save hundreds of dollars in pipeline construction. Chance Pipeline Screw Anchors can be installed in pipeline ditches without extra digging.

With a pneumatic or electric drill or impact wrench, the operator merely guides the anchor in place. The tool does the work.



Can be installed in the ditch without extra digging.

Write for catalog showing oil industry applications of Chance Earth Anchors.

A·B·CHANCE CO.
CENTRALIA, MISSOURI
TORONTO, ONTARIO, CANADA

T. O. Carson

C. B. Goff, Jr.

Rockwell Appoints Managers Of Sales and Products

A new Pittsburgh district sales manager and two assistant product managers have been named for Rockwell Manufacturing Company's Meter and Valve division.

A. J. Komich

Thomas O. Carson, formerly manager-distributor sales and assistant product manager-Nordstrom valves, now heads the division's district sales headquarters offices in Pittsburgh.

C. B. Goff, Jr. and A. J. Komich will serve as assistant product managers of Nordstrom valves and petroleum and industrial meters. Carson joined the company as a water meter salesman in 1935. He later traveled in Mexico, Cuba, Puerto Rico and Canada as a sales engineer in the subsidiary Rockwell International Corporation. From 1949 to 1954 he managed the International department of the New York district sales office, later becoming assistant product manager—Nordstrom valves in Pittsburgh. Since 1955 Carson also served as manager—distributor sales.

Goff joined Rockwell as sales engineer in Pittsburgh district office in 1949. Komich, who joined Rockwell in 1946 as a sales engineer, was named Boston district gasoline and oil products supervisor in 1951.

S. D. Day Company Moves to New Offices

Steve Day of the S. D. Day Company of Houston has announced the removal of the firm's office from its location on West Gray to the new Bayou Building on Buffalo Drive.

The firm distributes Pitt-Chem coal tar enamels, Ruberoid asbestos felts, Fieldjointers and Formula 291-Skinsaver.

Steve Day

Atlas Powder Establishes New Patents Department

Atlas Powder Company has established a new department to handle license, patent and trademark matters for all divisions and departments of the company. Kenneth E. Mulford has been named to direct the new department and will continue to serve as assistant to Edward J. Goett, vice president in charge of Atlas' chemicals division.

Roger R. Horton of the Atlas legal staff has been appointed assistant director of the new department.

Mulford served in a number of executive posts in the Atlas Legal and Chemicals departments before being appointed assistant to the vice president of the chemicals division in 1954.

Darling Valve Announces Personnel Promotions

Darling Valve & Manufacturing Company has announced the promotion of Carl H. Simon to vice president and general manager. Simon assumes full responsibility for all Darling valve operations.

Dick F. Sable, who has been named general sales manager, was formerly Southwest regional manager and came to Darling from Magnolia Petroleum Research in 1945. He will retain his offices in Dallas, Texas, where the Southwest regional headquarters are located.

Other promotions include Thomas C. Jester to chief engineer, James N. Elwood to manager—manufacturing and Packer B. Young, assistant sales manager.

GUNITE COATINGS for PIPE LINES

Reinforced GUNITE COATING being applied to pipe.

Your inquiry solicited.

GUNITE CONCRETE & CONST. CO.
1301 WOODSWETHER RD., KANSAS CITY 5, MO.
3206 HOUSTON, HOUSTON 9, TEX.
CHICAGO – ST. LOUIS – DENVER
MILWAUKEE & TWIN CITIES – NEW ORLEANS

premium

dielectric

proved

plastic

pipeline casing END SEALS and INSULATING SPACERS

Iow-Seal

corporation

First City National Bank Bldg.
HOUSTON, TEXAS

Contracting & Material has

7 CAT* Twin Arc-Welders on the firing line

LAYING a 30" gas line near Joliet, Ill., Contracting & Material Co., Evanston, Ill., has seven new Caterpillar Twin Arc-Welders on the firing line.

Never has a new product been accepted and put to use so quickly by the pipeline industry as the new Twin Arc-Welders. Here's why:

The Twin Arc-Welder has *one* engine powering *two* Lincoln welding generators mounted in *one* generator frame. The engine is a powerful Cat Diesel and each of the generators has an output of 300 amperes. When extra-heavy current is required they are paralleled to produce 600 amperes. Independent controls allow operators to weld at different currents at the same time.

Contracting & Material Co. particularly likes the fact that the arc is uniform and ready upon contact with no waiting for the machine to come up to speed. The company's welders report metal flow is excellent and the four-cycle diesel picks up the load instantly *without missing!*

The company, which switched from gasoline to Cat Diesel driven welders, found an immediate saving in fuel costs. The Cat Twin Arc-Welder is heavy-duty power in a compact package: The unit is only 35" wide and 129" long.

Modernize your welding operations with Cat Twin Arc-Welders. You'll slash your transportation and maintenance costs and conserve manpower. Your Caterpillar Dealer is ready to demonstrate the new unit on your job—*now.*

Caterpillar Tractor Co., Peoria, Illinois, U.S.A.

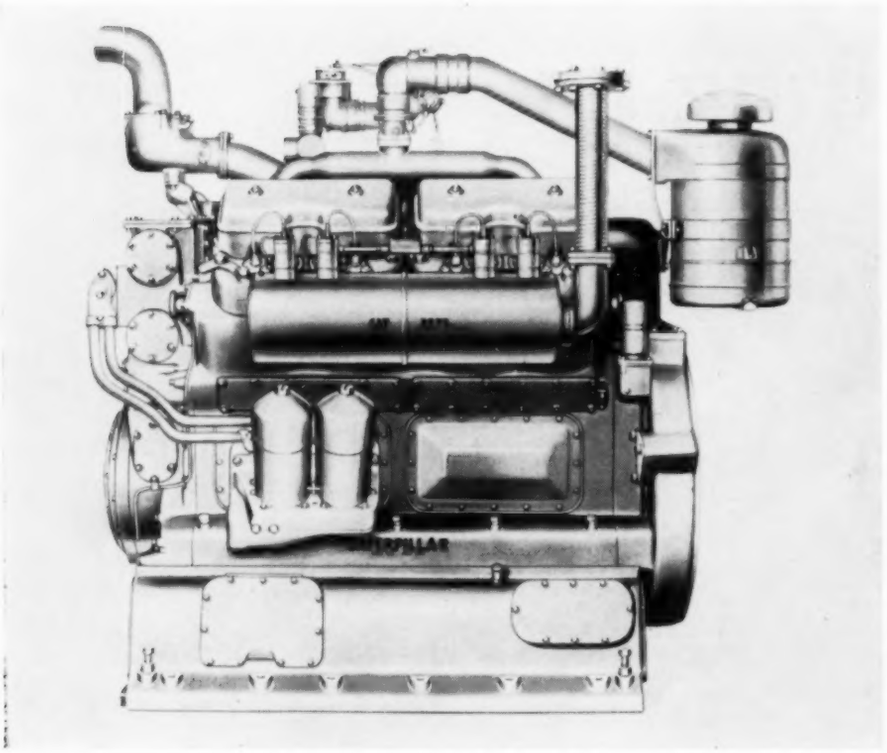
CATERPILLAR*

*Caterpillar and Cat are Registered Trademarks of Caterpillar Tractor Co.

MODERN HEAVY-DUTY PIPELINE WELDERS

What's New in Equipment

for the Pipe Line Industry



400-HP Cat D375 Spark-Ignited Engine

V-Type Engines

Caterpillar Tractor Company has announced two new heavy duty V-type engines capable of producing up to 650 hp (maximum).

Available in turbocharged, roots-blown, naturally aspirated and spark-ignited versions, the new eight and twelve-cylinder D375 (Series D) and D397 (Series D) engines are of four-cycle design. Principal differences between the new engines and Caterpillar's former models are in the cylinder heads, exhaust manifolds, method of supercharging, and in the case of the spark-ignited engines, the fuel used and the method of igniting it. Advantages of the former models, such as the completely water-jacketed, port-free cylinder liners and the low injection pressure, precombustion chamber-type fuel injection system have been retained.

New turbochargers now available for these engines enable them to produce increased power with less fuel by using the energy of exhaust gases which would otherwise be wasted.

New exhaust manifolds are offered in "dry," "shielded" and "wet" versions to enable users to adapt the engines to their specific needs. The new shielded manifolds utilize heavy layers of glass fiber, encased in steel, to keep heat out of the engine room without adding to the cooling load of the engine.

The new engines use low cost natural gas as fuel. They are expected to find wide application in areas where natural gas is available and are especially suited for powering pipe line pumps, sewage disposal plants, municipal pumping stations.

The space-saving new lubricating systems with engine-mounted filters which are now standard make the new engines easy to install. Large capacity, externally-filtered lubricating systems will still be available as attachments.

(This item supplements Caterpillar Tractor Company data on pages 1220-1223 of the Composite Catalog, 21st Edition.)

For more data circle **No. E1** on Readers' Service Card, last page this issue.

Rust Inhibitive Primer

A primer that withstands the Navy salt spray test and dries in minutes for recoating with almost every type of paint, even the strong solvent types of vinyls, lacquers and paints that usually lift other primers, has been announced by the Kimball Chemical Corporation.

Kimcote "ready-dry" primer for all metal painting is said to be non-brittle, even down to extremely low temperatures of —50° F, also stands heats to 350° F and is rust inhibitive as well as chemical resistant. It provides adhesion to galvanized, aluminum, iron or steel—rusted or clean—damp or dry—interior or exterior surfaces. Applied by spray, brush or dip, it can be recoated in minutes. The companion product, Q-H-D enamel, can be applied immediately. It also dries in minutes and has extreme chemical resistance.

For more data circle **No. E2** on Readers' Service Card, last page this issue.

Compressors

All Le Roi two stage portable compressors and Tractairs are now manufactured with new, deeper oil pans. The deeper oil pans allow the compressors and Tractairs to operate in more rugged terrain than the previously manufactured units. The new oil pans allow portable operations at angles up to 20 degrees and Tractair operations at angles up to 25 degrees, both more than double the previous operation angles and an advantage when working in rugged terrain. Le Roi's single stage compressors, the 85 cfm, 105 cfm, and 105 truck-mounted utility unit, are still manufactured with the same oil pan as previously, as these smaller compressors are used for work where steeper slope angles usually are not encountered.

(This item supplements Le Roi Division, Westinghouse Air Brake Company data on Pages 2941-2948 of the Composite Catalog, 21st Edition.)

For more data circle **No. E3** on Readers' Service Card, last page this issue.

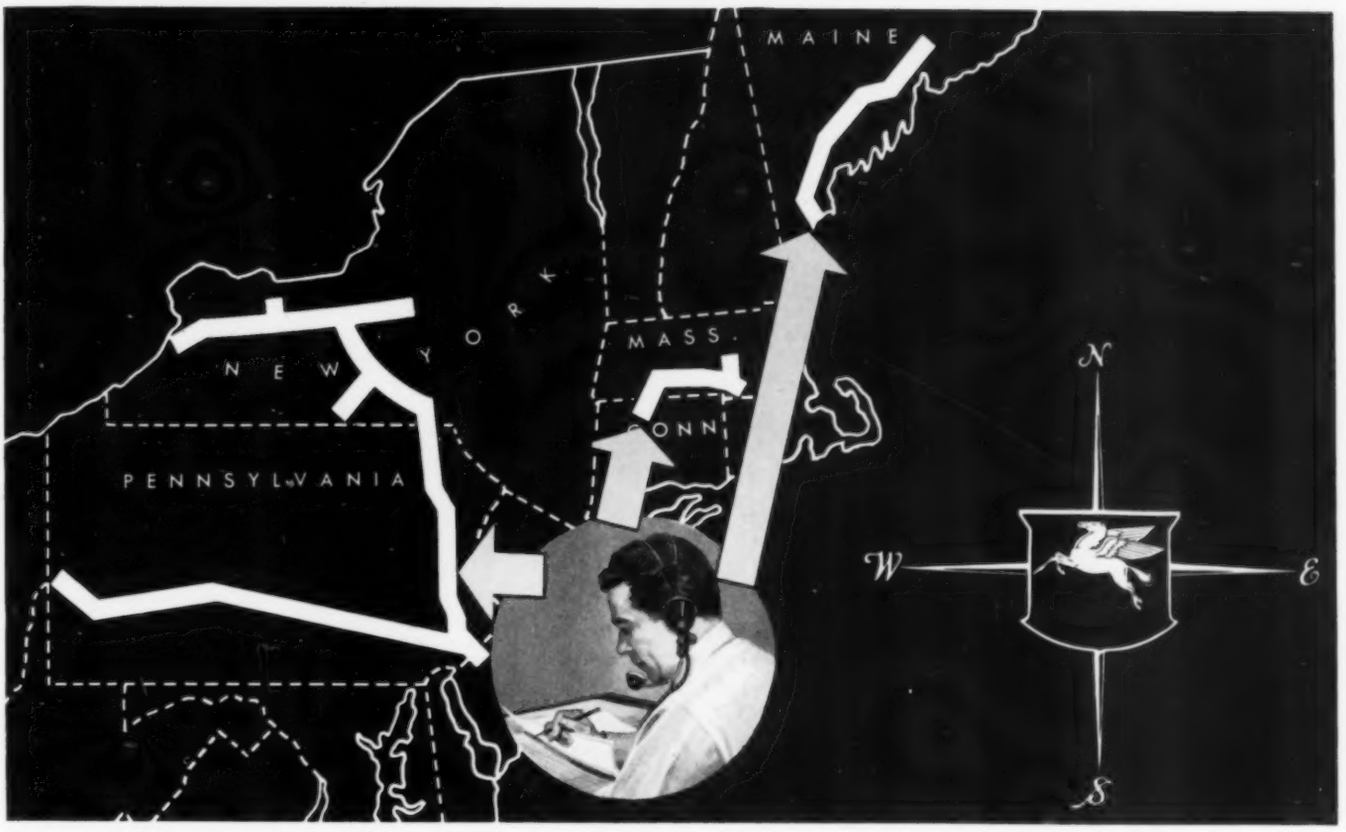
Fixture Hanger

An explosion-proof and dust-tight flexible cushion fixture-hanger has been developed by Crouse-Hinds Company. It is designed to eliminate damage to fixture and stem assemblies while supporting loads up to 65 pounds.

Action of a high-strength brass bellows is aided by a stainless steel cushioning spring to permit movement of the fixture stem as much as 15 degrees from vertical in any direction. A set screw locks the threaded stem in place.

Factory-assembled fixture hangers with junction condulets are available in one-half and three-fourths-inch hub and fixture stem sizes. Also available are separate fixture-hangers which mount on any of the CPS series form 20 condulets.

For more data circle **No. E4** on Readers' Service Card, last page this issue.



The dispatcher receives hourly reports on pressure, temperature, gravity, and rate-of-flow from each station on three pipe lines.

SOCONY MOBIL OIL COMPANY, INC., REPORTS:

One dispatcher controls three eastern pipe lines with Bell System private line telephone service

24 YEARS OF SATISFACTORY SERVICE

One dispatcher—in Plainfield, N. J. —controls 1077 miles of Socony Mobil pipe line in seven states, as shown on the map above.

He uses Bell System private line telephone service to get hourly reports on pressure, temperature, gravity, rate-of-flow and other operating information from as many as 60 points along the system.

Over the same facilities, he issues orders to cut in additional pumps or cut them off, run gasoline and distillates into tanks, or put products into the line from refineries.

Socony Mobil started using Bell System private line communications 24 years ago, and the company's growth has been accompanied by a corresponding growth in its communication system.

The Bell System can supply services to fit *your* exact communication needs, too. Just call your Bell Telephone representative for further information.

Socony Mobil uses these Bell System private line services:

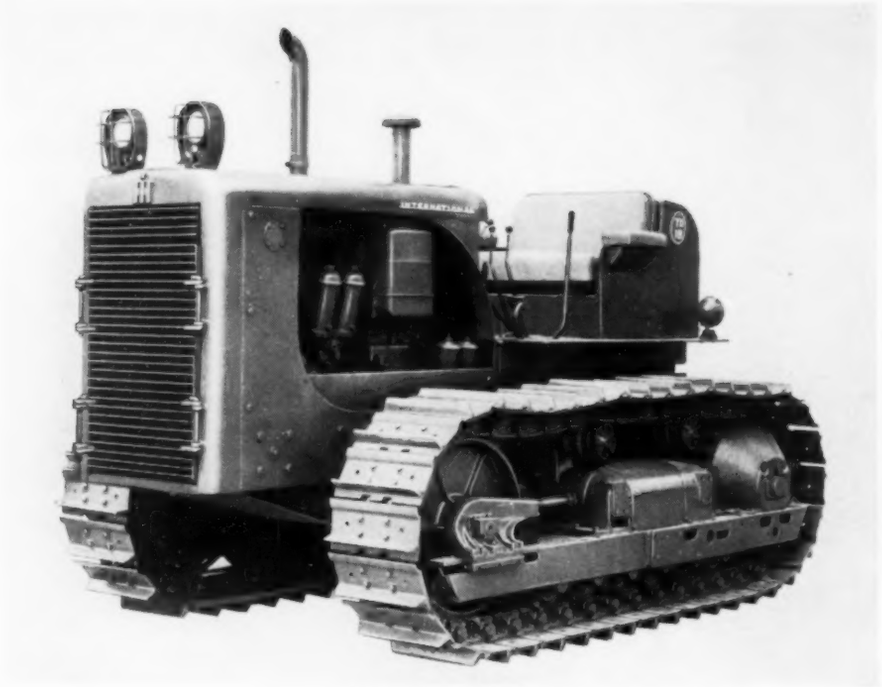
Private line telephone service for pipe line dispatching and general administration.

Private line teletypewriter service for fast written communication between New York headquarters and the Paulsboro, N. J., refinery.

BELL TELEPHONE SYSTEM

TELEPHONE TELETYPEWRITERS TELEMETERING AND REMOTE CONTROL CHANNELS

For more data on advertised products, use Readers' Service Cards, last page.



International TD-18

Tractors

International Harvester Company has announced the introduction of its newest and most advanced-engineered crawler tractor line comprised of four models, the International TD-18, TD-14, TD-9 and TD-6.

Engineering changes in these new models are substantially increased horsepower ratings in the TD-6, TD-9 and TD-14; better operator visibility; Cerametallic clutch facings; pressurized covering systems; 500-hour track roller seals and all-weather, positive, easy-starting conversion systems.

The TD-6 is rated at 41.5 horsepower. Matching the increase in horsepower output is a strengthened power train. The new Cerametallic clutch facing is an improvement on the TD-6. This clutch facing is composed of heat-resisting material similar to that used as brake linings on jet aircraft.

The TD-9 crawler tractor is now produced with a 54.5 drawbar hp and belt horsepower is increased to 66 hp. In the TD-14, the drawbar hp is increased to 78.5 and belt hp is increased to 89.5 hp. This increase makes the TD-14 the most powerful crawler tractor in its size class.

Outstanding changes on the TD-18 are the new 500-hour track roller seals, heavier radiator guards and streamlined appearance.

(This item supplements International Harvester Company data on pages 2605-2608 of the Composite Catalog, 21st Edition.)

For more data circle **No. E5** on Readers' Service Card, last page this issue.

Rotary Portable Compressor

Ingersoll-Rand Company has announced the addition of a new 900 cfm size to their line of Gyro-Flo compressors. With the addition of this size, the Gyro-Flo line has been increased to five sizes—125 cfm through 900. The 900 is slightly larger than the Gyro-Flo 600. The design of its six-cylinder engine enables it to maintain rated brake horsepower at high altitude. The 24-volt battery and ether-capsule system permits sure-fire starting at extremely low temperatures. Delivering full 900 cfm at 100 psi, the Gyro-Flo has ample capacity to operate ten jackhammers or seven wagonjacks (with light drifters) or three wagon drills (with heavy drifters).

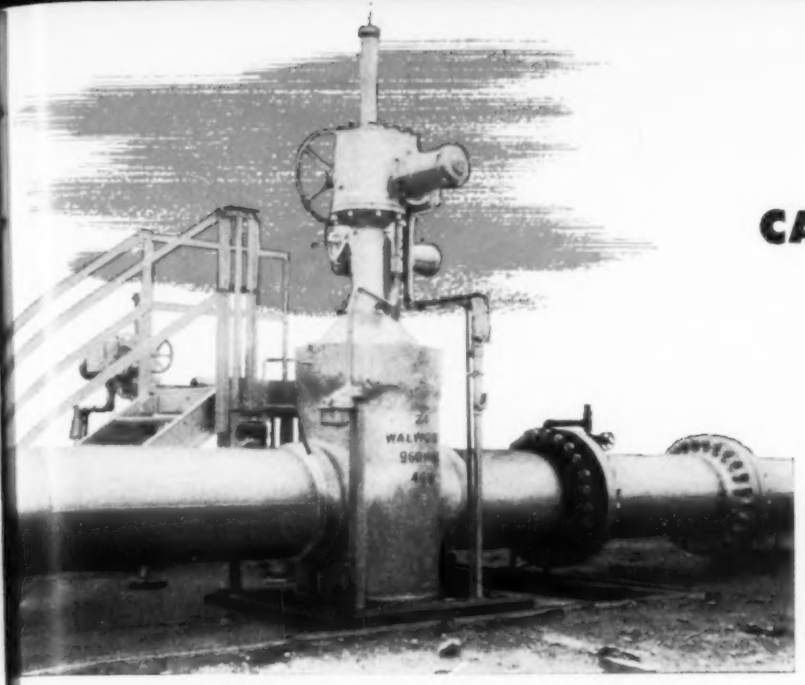
(This item supplements Ingersoll-Rand Co. data on pages 2597-2604 of the Composite Catalog, 21st edition.)

For more data circle **No. E6** on Readers' Service Card, last page this issue.

BIG FAST FILLER

THROUGHOUT THE U. S. AND CANADA pipeliners are making big savings in man-hours and over-all costs on backfilling work on both big and small diameter jobs. They're doing it with the Cleveland 190 Backfiller, the big capacity, one-man-operated backfiller, designed and built *from the ground up* to do all types of backfilling —better, faster and at lower cost. Talk it over with your Cleveland distributor.

THE CLEVELAND TRENCHER COMPANY
20100 St. Clair Avenue • Cleveland 17, Ohio

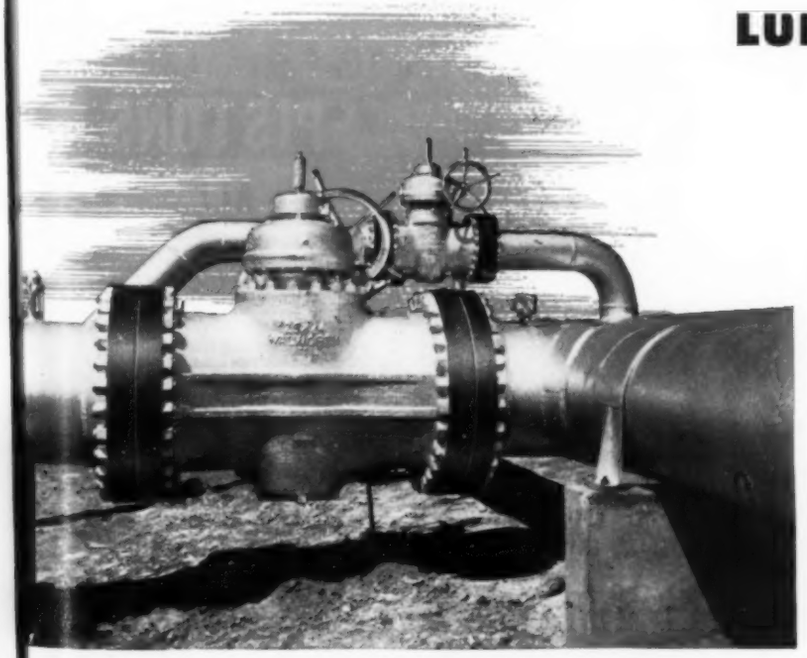


CAST STEEL GATE VALVES

A 24-inch Walworth Type 49 Series 400, 960 WOG, Cast Steel Gate Valve with welding ends and motor operating device, on a pipeline handling crude petroleum.

Walworth Type 49 Valves are especially designed for service on pipelines handling gas, refined products, or crude oil. Through-port construction allows free passage of pigs and scrapers. These valves do not require any internal lubrication and may be installed without regard to direction of flow.

WALWORTH makes both for pipeline service



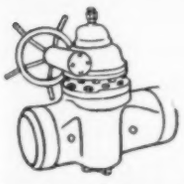
LUBRICATED PLUG VALVES

A Walworth 26 x 24-inch, 1000 WOG Cast Steel, Worm Gear Operated, Flanged, Lubricated Plug Valve installed on main line discharge of a gas pipeline.

Walworth Lubricated Plug Valves afford quick, easy operation . . . a quarter turn gives full, direct port opening. The lapped surfaces of the plug and body, plus the seal afforded by the lubricant, assure a tight, leakproof valve.

Always use Walworth lubricants in Walworth Lubricated Plug Valves.

Let us help you with your pipeline valve problems. Because we make *both* gate valves *and* lubricated plug valves, we can give you an unbiased recommendation regarding the best type of pipeline valve for your particular need. See your nearest Walworth distributor, local Walworth representative or write: ***Walworth Company, General Offices, 60 East 42nd Street, New York 17, N. Y.***



Walworth Lubricated Plug Valves for Pipeline Service

Made of cast steel. Sizes up to 30 inches. Working pressures up to 5000 psi.

Walworth Type 49 Cast Steel Pipeline Gate Valves

Sizes 2 to 30 inches, inclusive. Series 400 and 600 for working pressures up to 1440 psi.

WALWORTH

Manufacturers since 1842

valves . . . fittings . . . pipe wrenches

60 East 42nd Street, New York 17, N. Y.

DISTRIBUTORS IN PRINCIPAL CENTERS THROUGHOUT THE WORLD

Shovel Crane Mounting

A new method of attaching shovel-crane turntables to crawler or rubber-tire mountings, known as the "Shear Ball" mounting, has been announced by The Thew Shovel Company. The new mounting eliminates need for top or hook-type turntable rollers, for center pins and nuts, for exposed roller paths, and centering gudgeons, along with the maintenance and adjustment usually associated with these.

This new "Shear Ball" mounting can be described as similar to a huge ball bearing. A continuous circle of hardened steel balls, sealed in a hardened, precision-ground race, provides the means of attaching the turntable to the carrier or crawler as well as the rolling surface for revolving the turntable.

The outer race is machined on the inner diameter of the ring gear which is bolted to the carrier. The machined inner race is attached to the turntable bed and the design is such that the balls themselves interlock the two races and thus hold the turntable on the mounting. Special machine tools have been installed to machine and grind the races. All vertical, horizontal and radial loads are absorbed by the alloy steel balls that are held in lateral position by spacers and are completely enclosed, thus being protected from dirt and moisture.

For more data circle **No. E7** on Readers' Service Card, last page this issue.

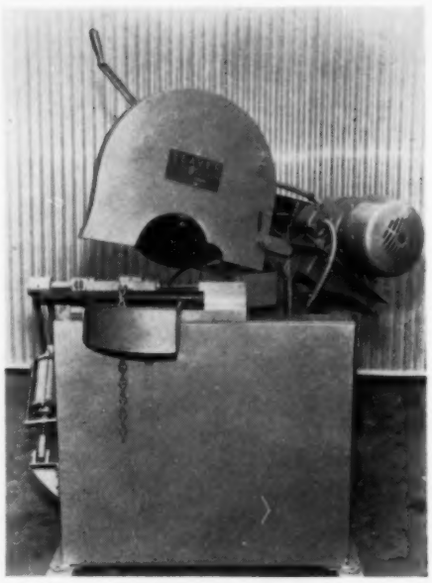
Cutting Machines

Beaver Pipe Tools, Inc. has added two new abrasive cutting machines to the line. These are the No. 20 any-angle abrasive speed-cut machine and the No. 20 wet-cutting abrasive speed-cut machine.

The any-angle cutting machine uses the No. 20 standard cutting head mounted on a special base with the pivot built into the base. Vise and material remain stationary. Cutting head swivels easily in a 60-degree arc, permitting any angle cut from 30 to 90 degrees. Large figures are stamped in the back edge of the arc for correct angle setting. A locking nut holds the cutter head securely and accurately in cutting position.

The any-angle is furnished with a magnetic switch and chain-type air vise. As the feed handle is lowered into cutting position, it actuates the air valve and the air vise secures material firmly for cutting. When the wheel is raised out of the cut, the air vise automatically releases. An air pressure regulator can be furnished extra. It controls vise pressure for protection when cutting tubing and other light materials.

In the Beaver wet-cutting abrasive cutting machine, the cooling effect of the liquid produces a polished cut with no burr and insures maximum wheel life. The machine is equipped with a circulating cooling pump (with separate motor and control). It has a settling tank with two baffles to filter out sediment. Coolant control valve is located conveniently at the front of the machine.



This machine is equipped with magnetic switch and air vise. As the feed handle is lowered into cutting position, it actuates the air valve and the air vise grips the material firmly. When the wheel is raised out of cut, the air vise releases. An air pressure regulator can be furnished, extra, for regulating the vise pressure. This prevents crushing material such as thin wall tubing pipe and other light materials.

(This item supplements Beaver Pipe Tools, Inc. data on page 614 of the Composite Catalog, 21st Edition.)

For more data circle **No. E8** on Readers' Service Card, last page this issue.

STANDARD OF THE INDUSTRY . . .
for cutting steel or cast iron pipe . . .

THE
ALSTON
Rachet
PIPE CUTTER

There's none better for SPEED, SAFETY, POWER, ACCURACY and ECONOMY. It eliminates dangerous sparks . . . broken cutters; rollers hold pipe taut after cutting. It's easy on and off pipe . . . will cut 10" pipe in 12 min. Patented roller guides. Rachet makes it easy to work in close places.

A size for every requirement . . . write for details, literature and prices.

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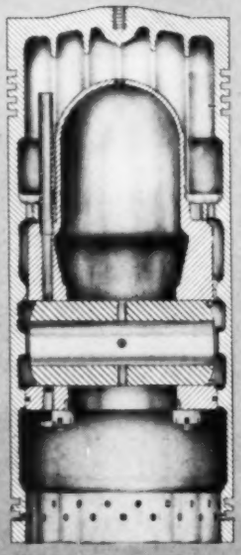
P. O. Box 707 **Phone 226**
LIVINGSTON, TEXAS

Let Us Give You The Facts About
NIMCO *HANGER TYPE* PISTONS
for ALL INDUSTRIAL ENGINES!



Successful users are the biggest boosters of NIMCO Hanger-Type replacement Pistons. If you operate large Diesel or Gas Engines, you should know their advantages too!

The NIMCO Hanger-Type Piston, incorporating a full-floating wrist pin, insures efficient oil cooling from below the pin to the top of the piston. This permits more uniform structural design of the piston body. No modification of companion parts is required for installation.

CALL OR WRITE TODAY FOR THE COMPLETE STORY!

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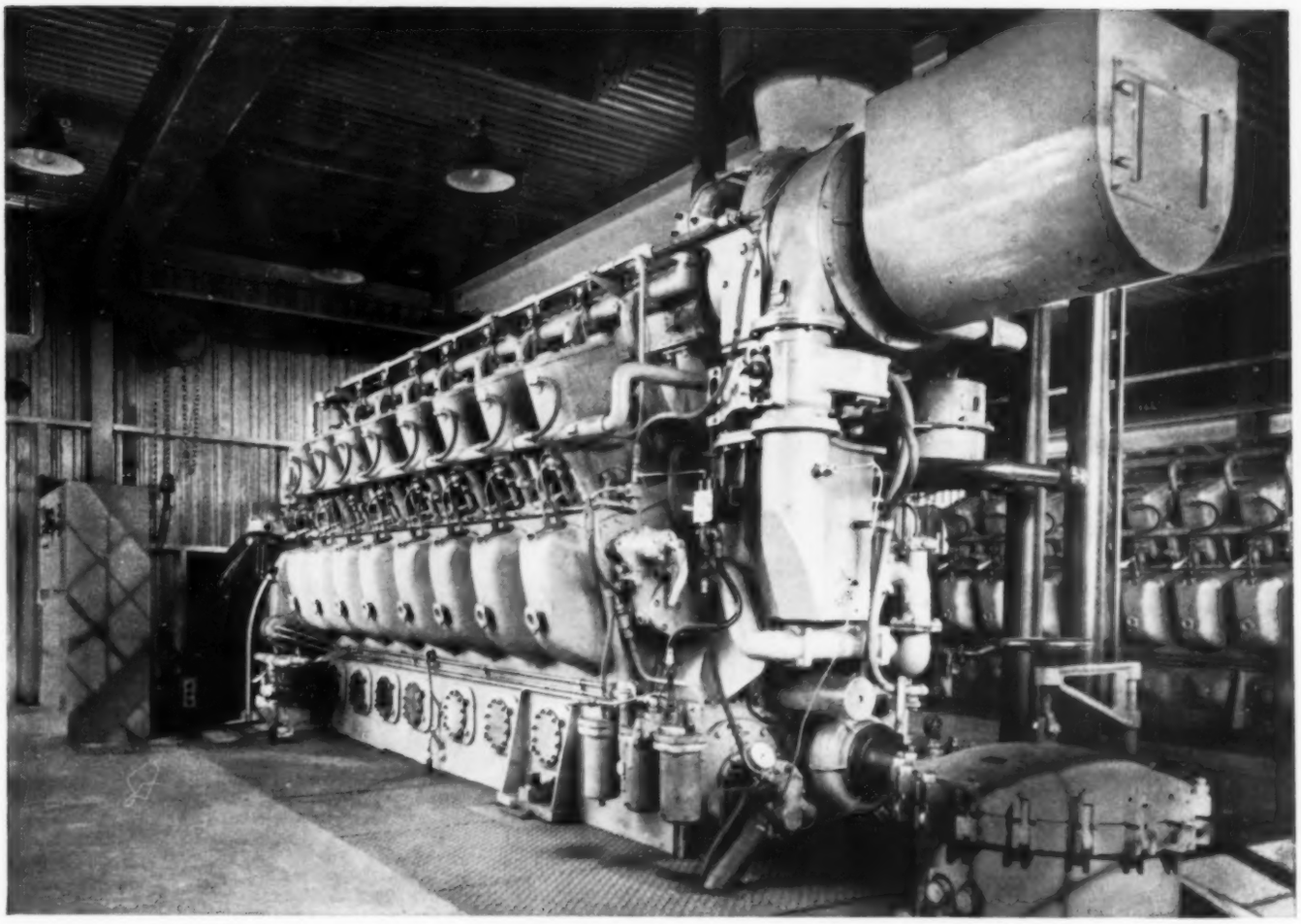
MACHINE CORPORATION
MANUFACTURERS — ENGINEERS
PONCA CITY, OKLAHOMA
Phone RObers 5-5558 Cable or Wire NIMCO P. O. Box 1747



One of two ALCO *251 Vee 16 diesels recently installed for pumping at the Laton Station of the Service Pipe Line Company.*

ALCO 251 DIESEL SETS MODERN STANDARDS IN WEIGHT, POWER, ECONOMY

The ALCO 251 diesel brings modern standards of light weight, high power, high efficiency and increased economy to all stationary and marine applications. Ranging in horsepower from 550 to 2400, the 3 modern turbo-supercharged 251 diesels — in-line six, Vee 12, and Vee 16 – all have interchangeable working parts. With a wide selection of standard modifications available, the engines are ideally suited to applications where the following advantages are desired:

Low Initial Cost — Standardized design, produced on assembly-line basis.

Low Installation Cost — Lower weight per horsepower, compact design, four-point mounting, and adaptability to "packaged" power applications.

Low Operating Cost—Strong, rugged weldments, modern metallurgy, adaptability to remote or automatic operation, and readily available, low-cost replacement parts.

Complete Service Facilities — Seven regional warehouses, three repair and rebuild centers, experienced field-service engineering.

Contact your nearest ALCO sales office or write P. O. Box 1065, Schenectady 1, New York for information.

ALCO

ALCO PRODUCTS, INC.
NEW YORK
Sales Offices in Principal Cities

For more data on advertised products, use Readers' Service Cards, last page.

Set your sights on an HD-6G

for top performance
for top dependability
for top versatility

Loading backfill into trucks
Padding and backfilling trenches
Cleaning up right-of-way
Hauling equipment
Miscellaneous loading and handling jobs

1½ yd bucket **55 belt hp** **19,600 lb**

and all these exclusive on-the-job advantages important to both owners and operators . . .

Allis-Chalmers long-life diesel engine — power that handles tractor and bucket demands with ease.

Heavy welded-steel shovel side frames and low stabilizer — provide greater strength, low center of gravity, outstanding visibility.

Full-flow filtering — filters oil three ways, provides long-life protection for hydraulic system.

Six truck-wheel stability — almost 7 ft of track on the ground for superior balance.

1½-yd two-position bucket — handles big loads efficiently in loose material or hard-packed dirt.

All-steel, box-A main frame — soaks up shock loads, protects the entire power train.

One-piece steering clutch and final drive housing — line-bored for true alignment of shafts and gears.

Straddle-mounted final drives— with bearings on both sides of gears to maintain correct gear tooth alignment.

Simplified lubrication (including 1,000-hour lubrication intervals on truck wheels, idlers and support rollers) provides extra working time.

Unit construction—makes service easier, faster. Major units can be removed without disturbing adjacent assemblies.

Plus husky wrap-around radiator guard . . . simplified piping . . . heavy-duty truck frames . . . heavy-duty, roller-bearing truck wheels . . . matchless control . . . and the convenience of 24-volt direct electric starting.

Check the complete service program offered by your Allis-Chalmers construction machinery dealer. His factory-trained servicemen, factory-approved facilities, and stocks of True Original Parts keep your equipment operating properly . . . provide the kind of service that saves you money. See him soon; he'll be glad to show you an HD-6G at work.

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ALLIS-CHALMERS

New Equipment Literature

For more data on New Equipment or copies of Catalogs and Literature reviewed in this issue, use the Reader Service postcards just inside the back cover and facing the Advertisers Index. Simply circle code numbers of items desired—sign and mail card.

Excavator-Crane

A new bulletin describing the Bucyrus-Erie 15-B excavator-crane is now available. Illustrated with photographs and closeups of mechanical features, the 40-page booklet includes complete specifications and working ranges. The 15-B is a one-half-yard shovel, readily convertible to dragline, clamshell, dragshovel or lifting crane for handling a wide range of excavating and lifting jobs. It is offered with gasoline engine, diesel engine or electric motor.

To get a copy circle **No. E9** on Readers' Service Card, last page this issue.

Engine-Driven Welders

The Lincoln Electric Company has a new bulletin on Shield-Arc, engine driven welders. Specifications and construction features are described for the SAE-200, gasoline engine-driven welder; SAE-300, diesel engine-driven welder; SAE-300 Hercules gasoline engine welder; SAE-300 Continental gasoline engine welder; SAE-400 gasoline engine-driven welder; SAE-600 gasoline engine welder.

To get a copy circle **No. E10** on Readers' Service Card, last page this issue.

Pipe Nipples

Pipe Nipples, bending and fabrication, are described in a new bulletin of Pittsburgh Nipple Works. For each class of nipples is given list prices, carton quantities, weights and A.S.T.M. specifications. There is a section devoted to nomenclature in the pipe nipple industry which explains terms and sizes of pipe nipples and a chart covering the length of all close, short, butt and special short nipples. The Pittsburgh Nipple Works line includes welded steel, seamless steel pressure tube, seamless steel pipe, wrought iron, stainless steel, plastic, aluminum, red brass, copper and chrome plated brass.

To get a copy circle **No. E11** on Readers' Service Card, last page this issue.

Mechanical Seal

Byron Jackson division of the Borg Warner Corporation has developed a new mechanical seal for unattended product pipe line pumps to assure that no pumped product escapes to the pump room. Literature and diagrams of the Type U mechanical seals are available.

To get a copy circle **No. E12** on Readers' Service Card, last page this issue.

Diesel Engines

Caterpillar Tractor Company has a new bulletin, "Why Cat Diesels Are Best" describing advantages of diesel engines over gasoline engines and characteristics which distinguish Cat diesels from other diesels. Turbocharging is discussed and schematic drawing supports the resume.

To get a copy circle **No. E13** on Readers' Service Card, last page this issue.

Lighting Installations

Crose-Hinds has issued a new bulletin, "A Guide to Lighting Installations," designed to solve problems in design of lighting installations for hazardous locations. Recommended illumination levels, factors affecting the design of the lighting system, and calculations required to compute the number and size of fixtures required to do the job are included in the bulletin. An additional bulletin describing flexible cushion fixture hangers, which solve the problem of suspending explosion proof and dust-tight lighting fixtures on long stems from high ceilings, is available.

To get a copy circle **No. E14** on Readers' Service Card, last page this issue.

General Catalog

A new catalog covering tank equipment, gas control, safety devices, automatic controls, electronic remote liquid level gaging and pulse code telemetering systems has been published by Vapor Recovery Systems Company. It includes a technical section dealing with tank storage conservation, vapor recovery and vapor balancing systems, supported by numerous tables and charts.

To get a copy circle **No. E15** on Readers' Service Card, last page this issue.

Manometer Instruments

A reference guide to manometer-type instruments has been issued by Meriam Instrument Company. The bulletin sets forth the four basic types of manometers ranging from the simple U-tube to the ultra-precision models, and provides principles to aid in proper selection. Specialized manometer instruments also are described for pressure, vacuum, flow and liquid level services as well as electrical contactor-type manometers and portable manometer kits for field instrument calibration.

To get a copy circle **No. E16** on Readers' Service Card, last page this issue.

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STOP THOSE CORROSION LEAKS ON BURIED OIL, GAS AND WATER LINES WITH "CORECO" RECTIFYING SYSTEMS

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A Complete Design and Installation Service. Call, wire or write today to

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Chicago-Wilcox understands the gasket requirements of pipeliners and is equipped to supply all types of gaskets including plain and double jacketed corrugated metal gaskets as pictured, compressed asbestos, vulcanized hard fibre, rubber, and all other materials in all sizes and shapes.

Send specifications for quotations and prompt-delivery schedule.

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FAST SERVICE

Our complete repair and overhaul service is of the highest quality. All work guaranteed and quick return assured. Let us keep your gauges and instruments accurate.

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Special sizes and lengths. Schedules 10 to 160 Stainless Steel, and other Alloys.

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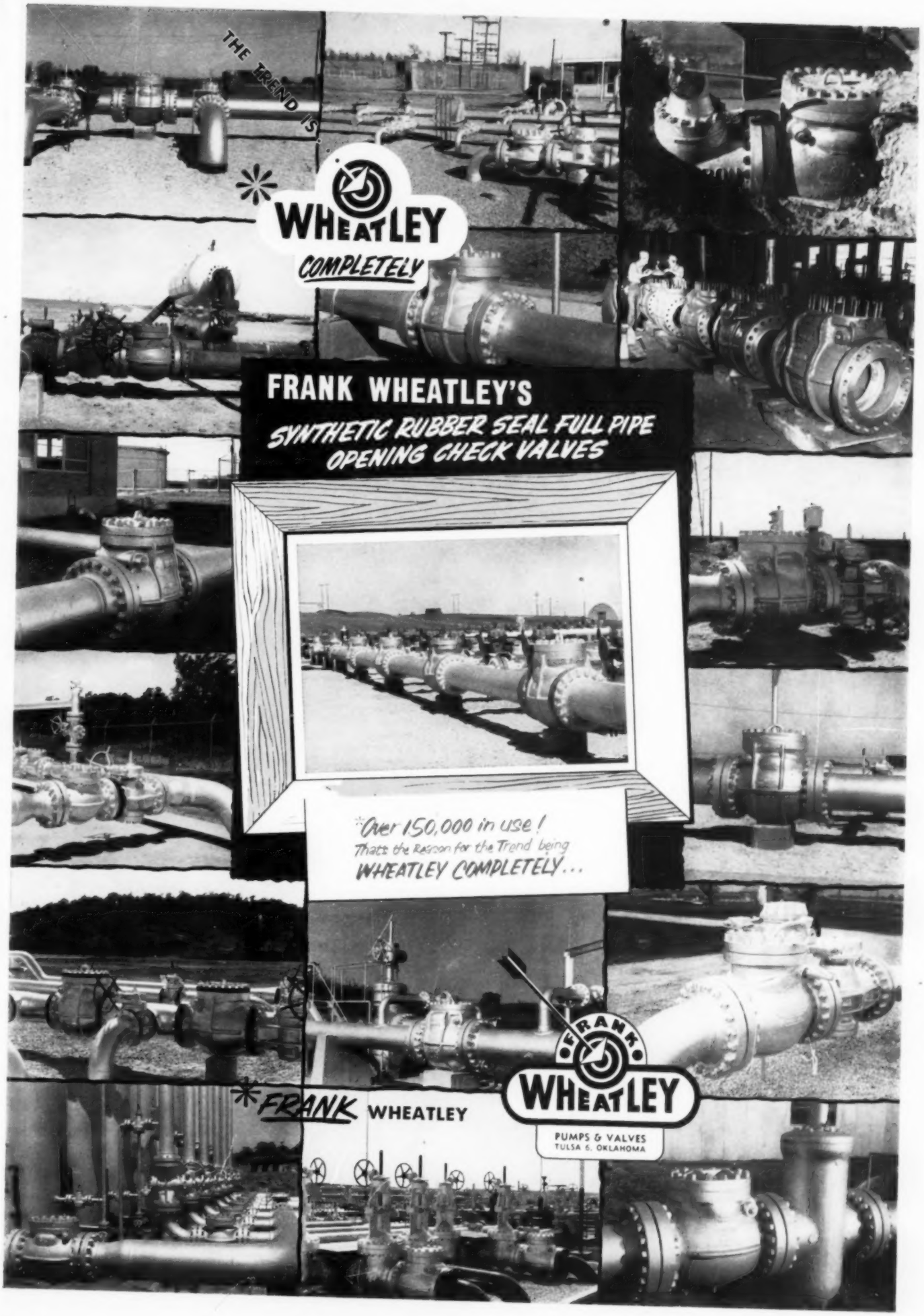
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*Over 150,000 in use!
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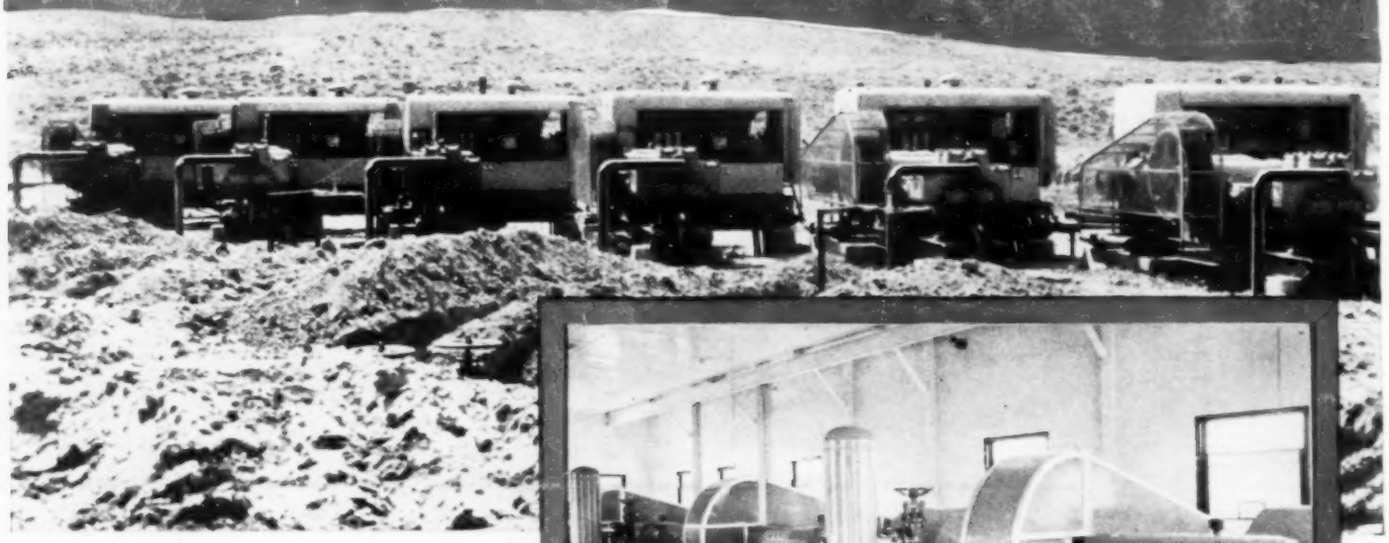
GASO *FLEXIBILITY* + GASO *ADAPTABILITY* + GASO *PORTABILITY*



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Count among all the other factors of Gaso leadership the amazing *flexibility* of Gaso Pumps. You'll find them in clean, well kept pump houses and in isolated, wind-swept desert locations. Wherever they are placed they do what they are designed to do with minimum attention and negligible maintenance. Delivering more capacity per pound of weight, they are adapted to a wide variety of uses. Their portability permits easy transfer from job to job. The result? Definite *assurance* of greater service, greater economy, greater return on the investment.

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